1. Never rest satisfied until you have found the best examples of a species which your time and opportunities will afford.

2. Never collect imperfect or immature specimens, unless they exhibit some character making such a step desirable.

3. Having found a station which produces the finest specimens, study it carefully, that you may the more easily recognize such surroundings again.

4. If specimens are abundant collect plenty, & the work on that species will be done at once, save as you meet with desirable varieties.

5. Remember that it is always well to have your specimens good and clean.

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Land Shell Faunas.

1905
Sep 25

Hood Island

Go ashore in Gardner Bay. Take a rocky ridge leading inland & begin a slow ascent. Evidently the dry season. For everything is dry & crisp. Look in vain under the rocks for shells. At noon on the high rocky pinnacle which overlooks the Bay I found the first shells. Diligent search soon brought many to light. They were in a state of hibernation — glued fast to the under surfaces of the rocks. Their favorite location seems in the rocks crevices where one stone overlaps the other. Working about this high rocky elevation Mr. Williams & I secured a nice bunch of specimens.

At first observation & with the limited number of specimens they seemed :—

Bulimulus hoodensis
" approximatus.

During P.M. I gather marine shells in Gardner Bay. Very poor territory - only get a number of specimens of Purpura plateola the same as the Cocos Island forms. Secured 1/2 doz. of the Clutons which are here especially large.

202

Sep. 26.

Head straight for the high rocky ground where I had yesterday's success. Spend the whole day here searching under the rocks and take more than 400 specimens. The species continue to be the same two reported on yesterday's collecting. Mr. Stewart joins me at noon — his barometer reading gives an altitude of 300 ft. Just now it seems that the shells do not occur on any elevation less than about 300 ft. At both I was not able to obtain any less than this.

Sep. 27.

Works on Gardner Island. Inland at an elevation of about 150 ft — the highest point on the island — I took about 25 specimens of land shells. They were all of one species — quite like "B. hoodensis" and approaching "B. snodgrassi". It may be possible that with a sufficient number of species I can find variation enough to construct a sub-species.

Mr Beebe returns from a long inland trip on Hood. He brings back a number of specimens. Among them is a questionable fluid species & very like "B. approximatus."

~~Another~~ Besides this ~~the~~ there are a

number of very minute forms. They are quite spiral in shape, but may be only miniature forms of the ~~two~~ ~~two~~ mature forms secured. He reports a great abundance - some in the roots of old grass, but all at an altitude of 1300 ft & upward.

Sep. 28.

During the middle of the day I collect some more of the land shells of Gardner. Still getting the single species cited on yesterday. Mr. Stewart takes the altitude as 175 ft.

I now have quite a series of these from which I may be able to build a sub-species. The forms seem just a little lighter in color than the Hood counterpart - which character may be attributed to the slightly less altitude. Again, they seem slightly dwarfed - due to the same reason.

Generally speaking there is little or no difference in the vegetation between the E. & S.E. side & the Northern - North West. Mr. Stewart however reports a slight difference in favor of the ~~Southern side~~ E. & S.E. side. On this latter side are the more Annuals, - on the opposite are the Perennials. What Perennials do occur on the E. are much bent, ~~over~~

some of them quite prostate, their heads & branches turned inland toward the N.W. Mr. Stewart attributes this difference to the direction of the prevalent winds & the greater ppt. of moisture on the E. & S.E. side. This character is well seen on Gardner, Hood, bears out the same idea.

Ferns. owing to the low altitude, the life zones are not strongly marked. The probable fresh leafing in the spring will show a more marked difference – at least in appearance.

Sep. 29.

Go a long distance inland on Hood. – No new species found. all the ferns taken were above 300 ft. in altitude. Thus far I have been unable to take any at any lower elevation than this – with ferns the exception of Gardner Island.

An important observation concerning the probable derivation of the island life was: on the E & S.E. coast of Hood I found quite suggestive quantities of drift – there were cocoa-nuts, large pieces of the ~~the~~ light bamboo, large worm eaten trunks of trees etc. It was at this point that I found the only patch of mangrove on the island – evidently a recent ~~bequis~~ acquisition. The beach marine shell specimens are also the most numerous here.

Must also note that I took shell specimens from the bottom of the large depression in the inner part of the island - a depression which evidently forms the little pond during the wet season. Heller & Snodgrass make mention of this pond in their bird paper. The forms were the same as formerly taken.

Gardner Island.

Oct. 3. Go ashore on Gardner Island, near Charles, difficult landing. Notice a great number of dead land shells. Worked up until I reached an altitude of 250 ft. or more. when I began to secure the live shells. They were in a state of hibernation glued to the dead tissues of old cactus leaves. The ~~bases~~ best suited place seemed a small pile of old cactus leaves. Another excellent place was the interior of the old rotten recumbent stems of the cactus. In the last named conditions they were glued to the outer bark. The station & environment of the shells was one of almost extreme dryness. The whole surface of the island is intensely dry & volcanic. But little soil has formed, & it is of a dry, sandy, large - small-pebble nature.

The dry, dusty nature of the sites is reflected in the sculpture of the shell, it being rough & much chiseled.

The whole surface of the island is completely covered with the dead shells. The crater, 740 ft high, was especially pilled as reported by Mr. Hunter & King who visited it. The specimens taken will be placed in a jar & sealed for safe keeping.

Oct. 3. Champion Island - (Near Charles.)

Spent about 1½ hrs. on this small volcanic island. Numerous dead shells found all about. Took quite a nice bunch of shells from the old crater, about 150 ft. elevation, the highest highest point on the island. They were taken from their retreat deep in the crevices & under the light lava blocks. The living forms were in a state of hibernation, glued fast to the stones. The forms were all like those of Gardner, but may be noted as a ~~color variation~~ coloration variation.

Secured one large dead shell of another species. Unable to get any live forms of this. Site same as Gardner.

Hood Island.

Jan 31 – Feb. 7, 1906

1. Bursera
2. Opuntia
3. Croton
4. Parkinsonia.
5. Acacia
6. Cryptocarpus

} First 7 characteristic genera to be used in general description of the island

Hood island at this time of the year presents a completely dried aspect. Everything is stiff & dry. even the salt-loving, woody leafed, bush of the beach is nearly destitute of leaves. A single tree the bursera, was beginning to bud out & lend some green to the otherwise barren appearance.

Began collecting on the shrubs directly from the lava flow. At an elevation of 200 ft. Numerous specimens taken - of apparently two species. The bushy bark, banded one. The tree, smaller compact one of a light color. As would be expected from the extremely dry condition of the

vegetation. all the specimens were found in a state of hibernation - their mouths securely glued, & sealed with a thin film. Underneath, & the under surface of the lava blocks.

Visited the S. to P. obscurus & the S. collected abundant specimens of the two species noted & possibly a third - a small, stout, variable, dark brown form. The specimens showed an interesting tendency to variation from the first series - the valley & the N. - the first taken. Should be further studied.

Will probably be shown geologically that these belong to the remnant of the old crater & since it is held known to have been almost to sea level a slight variation is to be expected. It is true however that the highest of the S. peaks & to some S.E. position may supply more moisture & thus accent. In this & parallel tendency toward the dark shades:

~~The~~ All the specimens taken show a fairly good tendency toward [illegible] & their environment - (as found.) collected in Gardner

Hood.

June. 23 – July 3, 1906.

At the time of this visit the island still presents the dried appearance, in spite of the fact that for entire time of stay there have been frequent squalls & light rain, occurring daily & several times in the day. There was ample moisture & pools in the hollows on the upper sides of the rocks. This moisture, probably the result of the recent setting in of the S. E. trades seems to have awakened the hibernating mollusks & active life. The rocks of which are afforded so many specimens on former visits, now have much less. & most of the specimens are quick & fat from the rains & nine slowly. This condition is true mainly of those shells on the higher altitudes – those due to the greater supply of moisture both in & on the rocks & to the drying effect of the winds on those further

levels.

Mr Beck takes a picture of a typical block of the middle three species of R. talladus. Photos also show the nature of the territory.

A notable acquisition is a number of specimens of Pupa. They were taken by Mr. Beck during [illegible] and consisted of surrounding a cavity under bark of dead wood Mr. Beck finds in the old tortoise bones.

Indefatigable Island

Oct. 23-27, 1905

The fresh water pond which during the wet season attains some size was at this season quite dry except along the W. border where a grove of mangroves still retains a pool. This pool was perhaps 25 yds. long by 4 wide. On the open where the lagoon had been there was a light coating of salt. Observed dead Auriculae like forms in the mud of the dried lagoon. Investigation of the pool showed quite an abundance of live forms. They were collected from the pool where their favorite position was under dead leaves, adhering to the roots of the mangrove and perched upon the young mangrove shoots. The surroundings are: cool brackish water, long grass & young shoots, continuous shade.

As no such form is reported from this island a large series has been taken, ~~with the idea~~. Such an isolated island, its size & age would indicate that the shell will prove be an entirely new species.

Working inland from the coast

dead shells were observed about one mile inland and at an alt. of about 200 ft. No collection made until at alt. 450 ft. where the specimens of bottle No. 36 were taken from under lava bluffs. in a complete state of liberation. The live forms were very scarce but dead ones equally numerous. The dead ones were traced to an alt. of 600 ft. where they became rather few.

Beginning with about 400 ft. alt. a small Septimania like form, dead, accompanied the one first cited.

At about 450 ft. alt. a great many dead Succinia were also observed. At this alt. ~~they~~ the Bulimulus (No. 36), Septimania & Succinia are all together. All

All three may prove to be new species. ~~For~~ Both the Septimania & Succinia are noteworthy.

This S. E. anchorage is one little visited because of its danger, and the general inaccessibility of this territory.

The rainy season will probably permit of the collection in a live state of all the forms seen dead.

Oct. 28, 1905

A long trip of exploration inland. Worked about W. of the first big hill (tortoise). On this direction there were three ~~ones~~ lying in a direct line W. from the first (big hill) These hills extended from the lower 400 ft. level to the 650 ft. - just a sand level & a transition into the 3rd or ~~sandy~~ dense true gravel zone, which began at about the 3rd. hill (alt. about 800 ft.) Owing to the dense walking territory only the sand hill could be reached. Began collecting here. Filled up a series of the large (B. ~~Jura~~ (cremulated) jours reported before. They were fairly abundant. (Bottle No. 36). These were accompanied by dead Succinia, the Septiania like forms, a small B. form, and the fine forms of bottle No. 37.

Bottle No. 37 represents another species not reported & therefore important.

Bottle No. 38. a Septiania like form - cremulated. Not reported & therefore important.

The vegetation of this (all (650 ft.) is fairly thick. Pines, or ~~cedars~~ and

the trees bore some considerable size, say 15-20 ft. tall. The mangrove may be very productive during the rainy season when the Succinia at best should be alive. Noticed a number of these last in a fairly good state of preservation under the lava flows accompanying these Nos. 36, 37, & 38.

Mr. Gifford reports that he saw a number of live Purpura on a slight elevation quite close to the mangrove swamp where the Auriculae were taken.

Indefatigable Island

Nov. 6, 1905. Academy Bay. South Side.

A long trip inland blazing a trail. No collecting done except a few shells taken by Mr. Williams. He secured a few of the Septiaria like forms of Bottle No. 38 under the barks of dead ~~trees~~ trees. still standing. The shells were in a conglomerate of lubelmatein. Alt. 300 ft. Specimens of the same as the species enclosed in Bottle No. 36. were taken from under the barks of dead logs lying on the ground. Just a few too, were found under the barks of dead, ~~tree~~ trees. 200 - 300 ft. alt.

This is evidently the dry season, the same observation made at the other anchorage.

During the trip inland considerable moisture fell - enough to wet the leaves & bushes.

This side of the island is especially marked for the great abundance of vegetation at the low levels. And the occurrence of plant characteristic of high ~~alts~~ alts. of other islands. Noticeably the ferns, lichens and

orchids many of putting in their first appearance as low as 200 ft. alt. Even at 200 ft. the rocks began to be quite completely covered with vines, mosses, bushes etc. The surroundings of the fifteen shells taken are far from the conditions of the other anchorage. These conditions may offer something interesting by way of variation in response & environment. Such perhaps as a lessening of the corrugated base of the forms taken at the more eastern anchorage.

Nov. 8 & 9.

A long trip inland.

No collecting until near the end of the trail of Nov. 6's collecting. Here at an altitude of 450 ft. the small forms of No. 44. were taken. They were reposing openly on the damp leaves and leaf mold of this rather damp level. Beginning with the 300 ft. level the vegetation became quite abundant; lichens, orchids & the prickly tree became in evidence: & the cactus had completely disappeared at the elevation of 400 ft. The ferns became more numerous & the trees attain

A Cudefatigable

a very considerable size (50-75 ft. high) a spreading over quite an area.
Beginning with the 450 ft. level just a few of the forms of No. 45 were taken. These taken were the smaller specimens. No. 45 specimens became more numerous with the continued advance inland until they accompanied the Succinia of No. 42. on the leaves of the abundant vegetation of the higher levels. It will be noticed that their shell walls are very thin like those of Succinia. — Adoptive response to environment.

After passing No. 44. ~~with~~ state in the forms of No. 43 put in their appearance. They were taken from the trunks of a peculiarly smooth barked, tall, Eucalyptus like tree which was first observed here. The shells were not strongly adhering to the bark and ~~in~~ considering the damp surroundings & altitude & frequent fogs they were in an active state of life. They attained quite a height on some of the trees, ~~some~~ from 10 to 35 ft. & in some cases higher on the large trees. ~~A specimen~~

It is remarkable too that the shells do not inhabit other varieties of trees, for none were taken from any but the smooth barked species. The station of No. 43 continued until the collecting was carried into the more fern, vine-encumbered, rich vegetation, which began at about 550 ft. alt. in its densest degree.

About where the tall trees of the habitat of No. ~~43~~, 43, became less numerous & the territory became rather fern the whole region is covered with a mass of almost impenetrable vines, nettles, ~~fern~~ tall ferns & thick brush, in the midst of this jungle the Succinia & those of No. 45 thrive & are taken from the leaves of the plants.

The first dead specimens of the rotten stipes bottle No. 46. were taken by Mr. Williams at an alt. of 750 ft. They are here entered because of a marked difference from the other large, shell-like one of this accumulated base which they resemble. At this point it should be noted that ~~this~~ the specimens identical with those of No. 36. The other undergrowth had many dead forms from the beach inland to about 750 ft. at this

last level the dead shells backed the beached condition of the lower level shells, thus showing that they had lived there the more recently — the longest — in the damper upper level.

It will be plainer if a summary be given of the different zones limited above in the shell habitat discussion:

0 — 100 ft. alt. first zone.
Plenty cacti, both species, the thorny leuceana like legume tree, the prickly green vine Euphorbacea. Very rocky pasturage

100 — 350 ft. alt. 2nd. zone
Lichens! cacti growing & greatest height in addition & the characteristic forms of the first zone. The upper part of this zone marks the beginning of the orchids & the disappearance of the cacti.

350 — 1500 ft. alt. 3rd. zone.
This is the dense green zone of the island. The trees attain great heights. There are no cacti, a tall grass & bushes grow in profusion. Orchids are most numerous. The upper part of the zone

the ferns are tall, umbrella trees & plantains are plentiful, there is a rich soil of light leaf mould which completely covers all the lava blocks.

A region of almost constant rainfall. Three or four heavy rains fell during the night & day spent in this alt.

1500 — upward. & the zone.

Absence of trees, tall savannegrass, & tall ferns.

— — — — —

Some of the passes seem quite barren. not visited.

— — —

It must not be imagined that there is an abrupt change between these zones. It is far from this. For there is a slow intergradation from one into the other with certain characteristic plants & conditions predominate. together with the absence of former conditions.

This gradual transition is more prominent on this, the windside, because of its ~~be~~ ~~more~~ facing in the path of the moisture laden winds.

Zones are not nearly so abrupt

as on Charles. It will be further noticed that the altitude & situs of shells on this side is relatively lower than those of the S. E. anchorage. A fact explained by the greater ppt. on this side.

Did some collecting in the salt lagoons directly inland from Academy Bay. The lagoons are now almost dry and there are numerous dead shells but no live ones were taken. Similar dead mist would seem that there are two distinct species here, one being entirely different from those of the S. E. anchorage.

Nov. 16; 05 Among some shells handed me by Mr. Miller I found the minute Succinea like form of bottle No. 37. which he found on the leaves of the wet zone accompanying Succinea. This is the same form which I secured from low bushes at the S. E. anchorage.

Also a few lenticular shaped forms (No. 77) taken from the wet zone.

Nov. 20.

At N.E. anchorage. A marked change in the vegetation. The dry. partly grass zone extends well toward the top, probably does not begin until an alt. of 2000 ft.
The soil is a rich reddish dust, the breakdown of the latest lava flow. No shells collected & none reported by the observers.

Nov. 23. Stopped two days at Seymour the N. portion of which is habitable. So low & dry that there are no land shells.

Nov. 25. Stopped for a few hours at Daphne. (Description of the rocks under Geology) Mr. Williams handed me the few specimens of bottle No. 51. Station is the day inside of the peaks. under lava blocks

Nov. 25 – Dec. 1.

Two of these days were spent in a march inland toward the high land. In all about 6 miles direct inland. and an alt. of 1100 ft was attained.
This area of country crossed was rather par. ~~level region~~. There were numerous meadow like patches of tall dry grass

Undefatigable

The common grayish bush, Croton.
the Cotton, + ~~the~~ a few cacti. & some
of the prickly acacia in general
comprised the vegetation. Rather an
abundance of the sweet scented bush,
Bursera. This zone reached an
alt. of some 1700 ft. where the
light green began to merge into
the dark green, which began
probably at about 2000 ft. alt.
At about 500 ft. alt. the first
dead land shells were observed.
At an alt. of 1100 ft. at the sides
of a ravine I found a great number
of dead forms, the same species
as the are at 5000 ft, were seen. They
were abundant under lava blocks, but
no ~~dead~~ live specimens are taken.
Bottle No. 50. is a fair example of
the forms.

J
Jan. 12-13. Academy Bay

Worked inland to "lunch tree", (400 ft. alt)
collected some of the small corrugated
pink apex shells reposing on the dead
leaves in the rather damp, & fairly

dense vegetation. Then proceeded a little further inland (5 or 6 M. about), where the larger rough corrugated, pale. forms had their station on the smooth bark of the peculiar eucalyptus like tree. In regard to these last, it was observed that the shell rather harmonized with its back-ground of light. brown bark, flecked & speckled with small & large silvery patches. The dark background of the added complication of silvered boots & branches the shell did not so easily detected. Again the smooth bark of the tree offers a fine surface for travel & a good surface for the hibernating season.

Jan. 15–18

A four days trip inland in an effort to cut through the green zone. The region up to Camp No. 1. has been described in former notes on the first trip. Two days.

Beginning at this point the party worked toward the top in a slow ascend over the gently sloping country. The volcanic rock are entirely broken down to form a deep reddish, clay soil and this together with the part of the former dense vegetation forms a rich, highly productive soil through

Indefatigable Island.

which only occasional rocks protrude. throughout this territory it is almost impossible to proceed a step unless one be armed with a machete and cut each step of the way. The nettles, small bushes, ~~wild~~ heliotrope, tall fern-like bushes, long heavy vines, some trees and the clinging vines of the ~~wild~~ morning glory all combine to form an almost impenetrable thicket - a green zone indeed. Carpetara continued

Soon after leaving the 600 ft. alt ~~level~~ the single, connected, pale B. flowers were collected from a new station - on the vines and leaves of the green vegetation. They were fairly numerous & were taken up to the highest alt. reached, 1100 ft., but during the last two hundred feet I assert they were far more numerous.

Beginning at 550 ft. the first bird specimens were taken. They continued through the whole green zone.

The brown zone - a low bush & brownish color & hung with moss

had a rather abrupt beginning at about 1200 ft. From this alt. it continued in alt formation [illegible] brownish cap for the entire upper levels of the island. As nearly as could be determined it appears that the brown bush decreases in height and the whole zone a brown grassy area

Mention the occurrence of the green Cairina like plant bush - beginning at 700 ft. alt. in patches - height 6-9 ft. - large bones etc.

At 350 ft. elevation a few Pupa & Helicidae were discovered under the rocks & old bark of a dead tree trunks. The Helicidae (a number of which were collected & are enclosed in No. 58) were a light gray. Figured in whorls banded. Probably the same as taken from the Anchorage, Punta Delarguada. Now while on the green zone & at an altitude of 1000 ft. one or two specimens of Helicidae were taken from the bones. These Helicidae were of a pronounced ~~conoptic~~ large brown, white.

Indefatigable

markings - the two shells ~~species~~ are undoubtedly different species and due notice should be taken of this. There are probably a few additional specimens of the genus Delibidae in some other package. - Mr. Kilbourn handed me a letter on our first trip inland

Clude fatigable.

July. 23, -'06- "Dove Pie Roads".

This is the due west side of the island and runs on a right angle with the trail inland from Aberdeen. This point offers a good point of observation in the observation of the altitudinal ~~start~~ start of the life zones.

The first orchids begin at 550 ft. alt.

Cymbidium at 700 ft. alt.

The name of the long vine so common in this geographic is "Cissampelos".

The name of the red bean tree is -/--- "erythrina" 150 ft. # alt. small bush 2½ ft. height.

Noticed quite a number of dead specimens of brown, basal strangated B. Jones near the shore, but no live specimens. Also some dead specimens of Pupa - probably "Pupa clarina"

Jervis Island

Dec. 20, 1905

Jervis is a small roughly circular islet some 1¼ miles length of the greatest diameter. The whole surface is covered with the loose lava blocks of a basaltic nature but very vesicular. About the centre of the island & forming a divide, from east to west is a series of three high points. The middle one being slightly the highest is about 1000 ft. The first zone consisting of a ~~shade~~ a few cactus & sparse growth of small bushes. This zone extends to an alt. of some 450-500 ft. where it leaves off quite abruptly for the second zone. The second zone is marked by a thicker growth of bushes, an abundance of the pale green moss clinging to the bushes & the absence of cactus. This zone extends ~~radially~~ to the highest summit, where the bushes become scarce & some grass & ferns are to be seen. During the stay ~~It~~ ab in this neighborhood it was observed that this highest summit is often fog decked. During the day of collecting Feb. 20. a slight rain fell.

At about 500 ft. or where the 2nd zone

Zone begins the first dead shells were seen. No live ones were collected here. From this level upward great numbers of dead shells flaked the ground with white. Search did not reveal any live specimens until at about 900 ft. From the 900 ft. level & the summit all the specimens of the series were obtained. They were found glued & the lower surface of loose lava blocks. Though quite truly hibernating they soon became active on removal from their hiding places.

The peculiar cremulation, the dark dusty like color compared with the environment forms an interesting feature. It should be further stated that the ~~rocks~~ lava blocks were reposing upon & sometimes imbedded in a loose dust much in color like the color of the shells themselves. Often times the shells were hardly to be detected when the underside of the rock had a sprinkling of the dust.

James Bland

Dec. 26, 1905 James Bay.

Dec. 22 & 23. These two days were spent in a expedition inland. The line of march beginning at the N. end of lagoon and extending nearly directly E. Directly back of the lagoon to running from the N.W. corner parallel with the coast in a southerly direction for about 2 miles is a rather steep rise of ground. Its average height is about 1,000 ft. Ascending this high bank the numerous white bodies of dead shells were scattered all about the ground. The forms near the coast were the rather short, plump, B. forms. They were numerous but no live forms were obtainable. At an altitude of 500 ft. the first of the elongated, ~~ri~~ribbed, ~~cr~~ramulated L. forms were seen. The two forms existed together, when at about 900-1000 ft. the Succinia began to predominate in appearance. The true species became quite numerous & continued up to the highest all. attained, ~~some~~ 1600 ft. But no live forms were obtained probably

due to the fact that this is the dry season. This side being somewhat in the lee of the direction of the moisture laden winds: the shrubs are permitted to live during the wet season & then during the dry they are killed the few remaining adult & young forms going into hibernation.

This condition of semi-arid & unfavorable season of pollen is augmented by the peculiar & altogether different arrangement of the vegetation. The whole rise of ground first mentioned, extending entirely to the sea level presents a real desert growth of vegetation. Here are large prickly trees, small bushes, numerous tufts of a long grass, and abundant growths of long, stony vines & trailing roots. Even protected spots years were still green. Cactus is surprisingly scarce; only here and there standing quite without ~~close~~ ~~cact~~ alone in the ~~cact~~ desert. Their presence ~~being~~ seeming entirely out of harmony with its surroundings.

On the same days Mr. Millspaugh & Mr. Safford went inland. A point some ~~three~~ 1½ miles to the S. of the first reached by the writer! They

James

Found a few live specimens of the ~~flora~~ fauna ~~which offer~~ (give names) which ~~often~~ were as low as the coast.

Dec. 26.

Went inland from the S. end of the lagoon. Found the bank to be 1300 ft. height. Heat ferns began at 1150 ft. The The green tipped tree a Compositae began at 2.550 ft. Same endemics. In ~~bad~~ dead specimens as at the N. A few more ~~Found~~ low green leaved bushes, than the same heights at the N. Some prickly acacia.

That the gate which offers as green from the vessel is really only the increased number & gender of the Compositae.

Noticed also that there were just a few large trees (4-6 in. diam) of the green leaved shore bush, which grew in the higher altitudes - 1800 - 1700 ft.

Dec. 27 - 28

Two days trip inland - camped at 1650 ft. alt. - much the same endemic vegetation as already noted. Some

few green ferns are present.
Worked inward a high rise of ground bearing directly E. from the vessel. At 1,800 ft. the tall. stout. tall. barbed. eucalyptus like trees is abundant, numbers of green ferns are seen & a few bunches of a stout. sharp edged grass. ~~Extended the~~ Quite a number of dead shells were seen. The smaller pentangulated B. species, similar to the one on Cinchafolia-bole which adhere to the smooth barked trees pitch, were plentiful & seemed to have increased very perceptibly in size. Some dead Succinia also present.

This condition of things persisted until the summit, 2000 ft. alt. was reached when the summit together with the whole S. exposure was a beautiful tropical green vegetation. Bushes were all heavily clad, ferns of several species were abundant, wild Heliotrope grew everywhere, & the coarse grass, so short on the N. slope only behind the rise, here grew more than a foot tall. Stout jointed forest trees were taller numerous. There were but few rocks protruding through the rich leaf-mould. Altogether it was a striking example of the influence of the prevalent winds. During the part of our stay numerous cloud formations were observed to be rolling up against the elevation from the S. &

James

S.E. Going down the elevation in a S. direction search was made for shells. The two ~~kinds~~ dead species cited for the N. side of the ~~river~~ elevation continued, ~~and~~ but the only live form taken was a single adult S. Bettii while some half dozen S. seemingly another species, but possibly immature Bettii. Rather surprised at this, but ~~Dr~~ may be that - though the frogs keep, their elevation greek like the others it awaits the rainy season.

Mr. Beds handed me one specimen alive of the B. annulated form, which he took from the inside of a bird's nest. ~~He also~~.

The S. specimens taken were reposing on the leaves of small bushes & grass, such for example as the wild lobelias.

Jan. 2-3-4, 1906

Go inland on the accustomed path - an old stream bed & the south of the lagoon. Made camp just & the E. of the elevation reached in the preceding notes, about elevation of 2100 ft. This region seems one of perpetual green - long grass, bushes, fairly large trees (30-40 ft. high), an abundance of ferns etc.

Quite close the ramp. a number of Succinia were taken from the grass. They occupied both the upper & under side of the blade. At this point too the first live specimens of the No. 56 species were taken. This land shell was found in quite an active state of life, on the leaves of some small trailing vines.

Ascended the highest mountain. as the higher altitudes were reached the vegetation changed very perceptibly. The trees & bushes diminished in size and number, the grass was more plentiful & taller, ferns were plentiful in some cases they ~~covered~~ quite clothed the trunks of the small trees & bushes in a thick growth; without going into the more truly botanical details of this vegetation we may say that as we reached with the 2300 ft to level, or the 2600 ft, the vegetation presented an entire change. Taking it in all it presented the appearance of the formation of the grass or grassy zone. Tree ferns were quite abundant.

As the gradual ascend was made, it was observed that Succinia became less & less in evidence until at the summit none were obtained from the world station = the grass.

An investigation of the loose, ~~bark~~ fern decked logs of the dead timber a number of S. were taken! They were found on the inner side of the

James

barks, and sometimes intermixed between the stems of the ferns. The form seemed a specifically different one from the lower (alt 2,000 ft.) They possessed an unmistakably greenish hue & seem in average size to be smaller than the S. Bettii. which is marked by its hazel brown & sometimes golden color. Unfortunately the two forms have been plotted in the same bed, but the heads of the higher alt. may be easily separated from those of the lower. The difference may not be well defined enough to yield a species, but if not, it is an important observation in its attitudinal & environmental influences.

Along with the S. under the barks of the trees, there occurred a minute, disk shaped shell much like the Succinea of Cuba. They presented quite a well marked specific coloring, and maintained an almost exactly equal size. The ferns bore much like the one taken from Clubpategable, a few from the leaves, and those from Duncan

did shrunken certainly form a new species

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alt. 1800

On the N. side of one of the S.VV. eminences in rather an open grassy vegetation, a long, slender bush ~~of~~ Juniperus Sabina grew. Specimens ~~were~~ almost all the specimens of No. 56 were taken. This large, muscle formulated shell, was attached to the ~~bushes~~ prostrate, always at a height of the top of the bush & partly shaded by the plumes of the top. They were in a state of hibernation, the thin membrane covered the mouth of the shell and protected by the stem of the bush & filled the little interstices formed by the irregular surface of the bark of the stem.

About between the altitudes 1000-1600 ft. The specimens of Nos. 55, 53, & 54 were taken from the under side of small loose lava blocks. The ~~ground~~ soil though quite fertile was dusky, and the shells were not easily distinguished for their similarly colored background. Just a few of the specimens of both No. 55 & that of No. 53 were taken from under the loose bowls of dead logs lying on the ground. all were in hibernation.

An important impression

at present

James

Important Impression.

It has been cited in the note that a few quartz & a few of the salt-marsh green bubble persist in reaching a very considerable height 1000 - 1,~~500~~ ft. and in surroundings not at all in keeping ~~with its surround~~ with its customary station. Again it has been cited that with the alt. & the present condition of the upper zone it would seem that the glassy zone is in formation. ~~Again it~~ Here there features there is evidence that the definite zones are now in the transition of formation.

Again it will be geologically shown that James is one of the newer of the islands.

The present position of the undulated shell in the melt zone may be a vestigial character of the rough substratum which certainly were present in the early time of the rocks, break down.

James.

Aug. 1-06. - N. of Sulivan Bay.

Thin east & S.E. side of the island is one great chaos of recent lava flows. A great number of large & small craters dot the landscape & the region of their disturbance extends upward to about 1,000 ft. alt.

Some few plants noted by Bursera, Cactus, Opuntia & Mesembryanthemum. Plants of both species of cactus have gained a foothold - increasing in density & with the addition of others found with increased alt. It is remarkable that in this extremely arid, rough territory the little mollusks should have found a station here.

'The specimens of No. 111 were taken at about 750 ft. alt. at the base of a barren lava cone. - They were buried under loose lava blocks - & deep in the lava cracks where they were exposed & were when the overlying lava blocks were torn away. 600 ft. alt. probably marks the lower limit of shell life at this point.

The long, slender, corrugated specimen

is undoubtedly the same species as the one taken just ~~in~~ clude of Patagonia.

Aug. 7-8 '06 --- James Bay. --

The vegetation of the lower altitudes has a marked grey & faded appearance, with the evidences of the passage of the limited period of ~~unobserved~~ greenery.

The abundance of the large trees & grass and some others - (Erythrina.) Pereskia etc. gives the first zone quite a different effect from the general typical first zone.

From about the 200 ft. alt. upward ~~the ground is quite~~ there are great numbers of dead shells scattered over the ground. The rather narrow based, corrugated form - No. 113. is especially numerous This species ~~extends~~ is found more abundant with increased alt. - seeming to reach their maximum at about 1,500 ft. alt. Probably the only live specimen This species is the one taken at 2200 ft. alt. from the leaf of a climbing vine and colored in Bottle No. 112 - as the smaller of the two B. pallescens in that bottle.

The larger & smaller ~~compared~~ B. spec

James.

A bottle No. 1113 were taken at 800 ft. Salt. under old wood. Some others were seen below & only a few above, so that this species is probably best at this point. & the dead specimens here probably mark the old station

Must look for an examination of the literature on these shells to determine the species.

At 1800 ft. alt. in a ~~valley~~ fine grass & fern grown valley. under the dead leaves & fr the bases of the grass tufts were rewarded by finding a number of specimens of Pupa. & ~~also~~ a few ~~of~~ 2 species of Helicinoms.

These forms are new records for the islands & goes to prove that these micro species have quite a general distribution through the islands.

The alt. of 1600 ft. marks the lower limits of these species & they would not be found here if it were not for the increased

vegetation ~~due to~~ in valleys - due to the drainage - they would not reach this low level. Properly speaking the limits of these small species are 2000 - 2850, Up.

The large B. specimen in bottle No. 112. was taken at 2400 ft. alt. from the stem of Compositae. ~~This form of the~~ ~~Dat 2400 ft. marks the limit of these particular plants~~

This same species was taken at the former visit from the same station but much lower down - at about the lower limit of this particular plant which this species seems confined. limits of this bush - 900 ft - Up.

~~The~~ The bush ~~does not~~ extends to the top & the shell follows it & its belt of occurrence seems marked by the limits of the ~~bush~~ plant.

Zones.

Generally speaking the vegetation zones of this island are very poorly marked. The general intermingling of some of the characteristic trees & ferns with the lower ones - and again the low forms extending upward. Examples of this is the occurrence of the largest forest trees & ferns near the coast level - & that of cactus high above in the green.

Roughly estimated there is about two zones - the second beginning at about 1300 ft.

Barrington Island

Oct. 20-1905

Go inland at the N. E. end of island. Working inland land shells are first taken at 200 ft. alt. At this alt. they were well hidden under lava blocks clinging to the hardened soil and in the interstices of the smaller rocks. Their state of hibernation was not complete. For on being collected & brought to the light they immediately showed activities. In many cases they were so lightly attached that a slight jolt in the pods caused them to fall off. No doubt this condition is due to the setting in of the rainy season. During the two days outside there was a good deal of light drizzle & heavy mists.

Continuing upward from the 200 ft. level the number of shells steadily increases. At about 300 ft. it is observed that a number of the darker, thinner forms are in evidence. These with the lighter greenish ones of the lower level may prove to be two species reported from this island. The short, equal D. nux may be an immature

June.

The surroundings are particularly barren.— lava blocks imbedded in & upon the surface red volcanic soil. Cactus & a few of the white dry bushes comprises the entire vegetation. No sharp thorned acacia. no grass 40 plants in circle.

Oct. 23.

Work inland. Follow the valley like depression & the N. toward the high rise of ground at the end of the circle. Nearing the N. end the collecting territory became poor because of an almost complete surface layer of lava blocks. Retracing & working on the right hand side of valley. The side hill joining the side made excellent collecting ground. The lava blocks were large, loose & there was enough of the red. broken lava dust to form a soil. — an important note in sites & habitat.

The specimens were attached to the under side of the lava blocks — not especially firm; and when removed some became active! The usual form of hibernation. though, was observed in all. In some instances the shells were attached to old dead twigs & leaves which lay immediately close the rocks or partly under it. This last is particularly true of the brown species which the gray or green ones were usually attached & the latter an important note in color variation & adaptation to closer surroundings — perhaps for protection

BOTTLE No. 34.

Duncan Island.

Dec. 2, 1905.

Duncan island is nearly circular in form. (see map) The diameter is about . The surface is extremely rugli, the rock being loose, rather pumiced lava blocks of the black basaltic family. To the westward the top is broken down into two large craters. The E. side of the circle is the highest point. Alt. ~~1275~~ 1300. The sides of the island are generally ~~also~~ rather steep; & the height of 1275 is reached within a horizontal distance of $\frac{3}{4}$ of a mile inland.

The sides & of the island are very sparsely covered with vegetation. The small dry brush, a few cotton bushes & some cacti just rather a good deal in proportion to the other plants, the prickly acacia. Castilla Near the top only at 900 ft. the lichens & Spanish moss begin to appear & increase in abundance toward the summit. At the summit there is quite a fine growth of ferns, orchids, grass & bushes. On the inside of the

Top rim of the crater the ferns formed a dense network of cross like leaflets of texture. The grass & general surroundings were exceedingly dry at this time of year.

At about 900 ft. alt. - the first dead shells were seen. No live ones. Up & the Top the dead ones became more numerous. The three reputed forms, Succinea, B. alla & B. duncans, were recognized among the dead.

Descending & the top the collecting was done there. Bottle No. 47. contains 3 specimens the largest shells, in a fairly good state of preservation. No. 48. the only two live specimens of the large shells taken. ~~Each~~ entwined among the roots of the grass which lined the rim of the ferny depth by an overturned rocks were the minute Succinea like forms contained in Bottle No. 49. It will be remembered that these occurred ~~were~~ duck gathered in a similar station in the dry gulch. On the mt. ~~gulch~~ side of the S. side they accompanied Succinea on the leaves

Duncan Island

the bushes & grasses. This species has not reported from this island, due perhaps to its minute size. It will be valuable in species building & a determination of some relation between this island & Indefatigable.

Aug. 14, 1906.

Ascended to the top of the island. The first shells taken here at 550' alt. - some lower than at the time of the first visit. All the vegetation was in a dry parched condition - the brief moist season having passed and generally it presents the aspect of the winter season. It will be remembered that at the time of the other visit two displaced but two light showers fell.

As on the former visit there was great difficulty in obtaining fine specimens. Collected a number well grown & had specimens of Succinea "Bettii" & the two B. "olla" & "duncanus". Mr. Williams

found one live specimen of the large
B. probably B. "duncanus" I
made the important collection of a
few specimens of Pupa. They are
like the common Pupa of Albemarle, and
upper Indefatigable. Within the
minute Helix. Some specimens taken
at the time of the ~~first~~ first visit
make two genera & species to be
added to the list of the islands
molluscan life!.

Chatham.

Oct. 17-05.

Wreck Bay.

Worked in the lower level just in land from Wreck Bay. Fine land shells are scarce but plenty of dead ones. Secured the specimens in the two vials labeled No. 32. These forms were taken from the under side of lava blocks at an altitude varying between 25 - 60 ft. The situs was that of the dry surrounding characteristic of the first zone. According to Dr. Baur's works two forms are recorded from this level, both of them are Bulimulus. The long spiral there may prove to be a new species for this level.

It is to noted also, that these specimens were accompanied by a few dead Succinia. Observing the water courses & the general "lay" of the land it is not likely that they were carried here by waters and as no Succinias are reported from this low level it may prove of interest. Perhaps the rainy season may show some Succinia at this low level.

Chatham Island

Jan. 24.-29. Wreck Bay.

herb
1. Bursera
2. ~~H Phor~~ Polygalla - small
3. ~~Isobob~~ Borbaavia
4. Maytenus
5. ~~&~~ Ceus - Opuntia
6. Desmodium
7. Amaranthus.
~~&~~ Croton. Cotton.
about 500 ft.

Characteristic plants of the first zone.

When this region was visited about Oct. 17. '05 the first zone of this island presented quite the dry zone aspect. The Bursera, Polygalla, Maytenus & Croton all small bushes & herbs were quite destitute of leaves. ~~About~~ The little green turtle region was green it by the sea-island cotton ~~with~~ multiple large green maple-like leaves. and the pinnated ~~leaves~~ sprigs of the tall, bush, broom-like leguminosa. The light, reddish volcanic rocks

~~were~~ are well weathered to form a clayey soil which fills the interstices between the well worn basaltic lava blocks. The absence of ~~the~~ undergrowth characteristic of the dry zone and the general dust like condition of the light soil gives things a barren aspect.

This condition of things partly accounts for half polished surface of the shells First gone 0-500 ft. alt. Jan. 24-29.

On this visit the whole lower portion of the island, in the neighborhood of Nreds (Bay), presented an entirely changed condition - all was fresh and green. All the bushes named as characteristic of the first zone, were budded out. The small herbs, and vines were in bloom and ~~having the~~ from having the barren condition of the soil - its rocks & absence of grass, the whole looked like the green zone of other islands. This change was due to the advent of the raining season.

During the first 3 days made on the island there was almost constant showers, coming in quick succession. The little watercourses were like small creeks. This condition of affairs continued for the time mentioned when it became pleasing & remained clear the rest of the visit. According to the natives the rainfalls for perhaps a week ~~it~~ ~~not~~ that with only slight intermission between

Chatham

shores, when it ~~rains~~ ceases to be ~~fair~~
for an ~~equal~~ equal length of time.
~~This~~ From the data I am experienced
before arriving here & observations during
our visit and in adjacent territory
it is evident that Chatham is especially
favored with moisture precipitation.
(Bring in the fact that at this time)
1. (Hood is entirely dry
2. (investigated with the Blue Book
may suggest
3. (Bring in the testimony of the abundant rains
as a factor in the environment & its
effect on sculpture

Collected five species of the
two species described this first
time: the B. & the L. forms.
The animals were quite active &
beside being under the stones were
frequently taken along the outer
loose edge of mats & mantle the
soil.
Made the important collection
of two specimens of Succinia. Taken
alive from the stems of the small

bush. Croton. Their altitude was about 250 ft. only half the alt. of the first zone. They were taken in a marsh-bordered where the [illegible], dead shells were the most numerous. No young specimens were taken. (Ought to show that this S. is diff. species from the one occurring higher up. which will probably be seen from the intended collecting height up.)

Basset Point Anchorage

Feb. 8, 1906

"This region is very rough, abundant lava flows of the [illegible] kind, the vegetation is thin, ~~bare~~ the characteristic, few cacti. and in many places the ground is cut up into small islands by the lava flow. First zone extends to about 1100 ft. alt. Owing to the rather steep slope, and loose nature of soil, the territory is poor for land shells. ~~The soil has been parched~~ Those rocks not the part of a flow are half buried in the loose clayey soil. The few land shells taken were all under & in rotten logs and limbs lying prostrate on the ground. ~~Only the first zone~~ The same two species (B. & H.) were taken. but only a few. No Succineas - lack of rain.

Chatham

First zone 500ft. alt. 2 species (B) possibly a 3rd. + Succinia long spira

1st. z: 1100ft. alt. " " . Fairly recent lava

Old crater. - 620 specimens of possibly 2 species (New?)

274

Feb. 12, 1906

Finger Rock represents a old insular condition. The whole is a great volcanic one. about ½ mile in diam. & circular in form. On all sides from the rim the rock mass drops away in almost perpendicular walls. Access to the interior is only by means of a narrow cleft in the slightly broken S.E. side through a small cleft in the rim. The rim itself is ~~gracefully~~ ~~sloping~~. The average about 1,700 ft. above the recent lava fields below. ~~About the rim~~ Within the floor of the crater is some 12-20 ft below the general rim. except on the N.W. side where the rim rises up into a high pinnacle, 640 ft in total height, giving the whole mass its name of "finger rock". The whole mass is composed of ~~tufa~~ the reddish, yellow sand stone like tufa. Inside the basin this ~~rock~~ easily eroded material has broken down & form a nice fertile soil. well grown over with long grass, small bushes, & trees of considerable size. Numerous old ~~trees~~ dead trees are standing about in the basin. By pulling off the loose barks one finds abundant remains of land shells, glued fast to the

bark & the rotten wood of the tree, head downward. The rather fertile surroundings, soil & vegetation, would suggest that the shells be polished while they are rather prettily of the species but one, then the series taken illustrates different stages of shell development! the large shells have a ~~black~~ bluish tinge.

The specimen were in a complete state of hibernation. The mantle is securely held by the thin membrane which is highly elastic & often allows the shell to be drawn a bit. 1/8" or in. From the ~~foot~~ supporting wood before it is finally torn, to leave some of its tissued food & the wood & & the mantle of the shell.

The animal was at rest, behind a second membrane built across the tube about the dist. of the first which backs from the mantle.

It will be geologically shown that the whole Pinyon Rocks were but the pleuratic of a former

& much older insular predecessor.
This will be important as a environmental & derivative nature of the molluscan life.

Feb. 22, 1906

Worked into the interior of the island, — the upper levels beginning with the hacienda at 1000 ft. alt. From this point the old volcanic cones rise in gentle slopes & form the most beautiful rounded, grassy hills, ~~much like~~ much like the rolling hills of the Northern States of our own country. The great age of the island is here easily apparent. The lava formation is completely broken down & form a fine, rich, reddish-clay soil. The depressions & rims of the old craters are completely gone: indeed it is one would hardly suppose that at one time volcanoes existed here, covering all with a fiery flow: ... (Mentioned all mattered on my description of it)

The general arrangement of the vegetation is peculiar to this island: it lacks a counterpart in any of the other islands. (A somewhat lengthy & involved description may be avoided by the use of the plate.)

Chatham

~~And~~ Going inland by way of the road, the characteristic plant formation of the first zone continues to a height of 500 ft. (stated previously; on pale) where in ~~the~~ a short distance. About 150 ft/alt. ~~a transition~~ a slight change ~~to~~ is noticeable. The change being principally the presence of orchids, a few ferns. The native growth has been supplemented at this altitude by the introduction of lemon, orange & fig trees etc. These fruit trees have flourished. ~~[illegible]~~ This last change in the vegetation forms a sort of transition between the first & the second zone, which covers the whole upper levels. Thus there are only the two zones; the first, a transition & the second.

On the E. & S.E. where the moisture laden winds first impinge the first zone meets the transition does not reach so high as - possibly no higher than 400 - to 450 ft. Immediately above the grassy zone extends down the lowest on this side. ~~With~~

The second zone is best described by the word "grassy" — great plaines of a luxuriant growth of tall grass. Toward the highest points a few tall ferns are observed. Club mosses & fruddly a few Tree ferns stand out above the grass at the summit of the highest point. (Stewart took the alt. as 2100 - map gives 2420)

The figure (a plate) represents the actual vegetation belts as mirrored pen-sketch & verified by the actual figures of investigation.

It will be observed that the Barsa Pt. region being in the lea of the ~~prevail~~ prevalent weather exposure the 1st zone & transition reach their highest altitude.

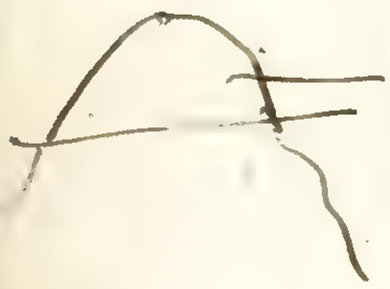
The N.E. end. is marked thin. (as cited in notes ~~but~~ merged here) This region ~~is~~ having so recently passed through volcanic activity ~~the~~ only the hardier plants & first one - ~~exclusive~~ to have found it possible to survive

Better ~~develop~~ developed 4 plates. 2 zone, - the lateral view from W:- same from E: the view from top ; the view from S.W. giving slope & belt arrangement

~~All~~ The collecting began at about 1200 ft. which ~~the~~ first specimens, Succinia. taken from under the moss. which covered the top part

the weather side of fence posts. Entering the arena, the Succinids were soon joined by the smaller B. (bottle No. 64) ~~taken~~ ~~in~~ higher up in the same station the two were joined by the large tunneled B. (bottle No. 64). The S became more abundant the higher they were taken; always in the same station.

In a area described as the frustrum (both up-this term) of the highest hill, having a vertical axis of 30 ft. the best collecting frustrum (?) was experienced. 5 species



S. P. A. & 2B. were all taken here. Their ~~station~~ were collected from the ~~bottom~~ base of the stems of the matted grass & weeds, which must be borne aside before the specimens could be seen or taken.

State ~~here~~ that this region must always be green. That there are numerous places here that do not reach the levels of even the hacienda, as found on the actual day of collecting. State this in description of the end zone. & in a modified form

here

Mention also that going down toward the E. & S.E. in grassy areas that the small B. persisted after the others had disappeared.

Chatham.

July 3 – 7. – 06

Collected for a short time in the first of the tall grass patches which grow in little ravines in the open country of the grassy zone just above the Hacienda. The specimens taken were the small B. Jonus of No. 108. They were taken from the bottom of the fern stalks quite on the ground – At an altitude of about 1450–1500 ft.

Beginning at the hacienda and following the trail about E.S.E. – in the direction of Fresh-Water Bay – the first 200 ft. of descent is taken up by the great cane & banana fields. No shells were found in this cultivable area & I believe that some of the many species reported from this island have be crowded out by the cutting away of the native forest and supplanting it by cultivated fields. In this direction at about 700 ft. alt. the cultivated fields discontinue & the dense tropical growth begins. Even this growth presents a slightly changed condition from the primitive growth –

having a large admixture of open trees. But the tropical nature prevails & it was in this Territory that the large B. & long spiral shells were taken. All were found at the base of grass tufts & under loose brush & fallen wood. Unfortunately no live specimens were secured. The range of the long spirals, so similar or possibly identical with those taken near Nebbs Bay, agrees with the general idea of greater latitude, will be an interesting consideration.

During this visit the upper levels were quite dry, & the artesian report an exceptional absence of rain, though there were frequent heavy fog clouds which precipitated water enough to wet the grass, but not heavy enough to wet the soil.

Notice the Temperature lists — this is the island's winter season: Most yes quite all of the live shells were in a condition of hibernation.

Notice the record of a number of specimens of Pupa. No. 110.

Albemarle Island.

Nov. 1, 1905 Turtle Cove

Just back of the gap of houses on the point of land extending into Turtle Cove are a number of lagoons. Their extend some distance inland, forming ponds in the lava depressions. In some places there is quite an abundant growth of mangroves along the shores of the pools. Most of them (pools) have a thick bottom of heavy muck & sand. The lagoons are made possible by the particular cracked nature of the lava flow through which the abundant water of the highlands has easy seepage. When this water reaches the sea-shore the back water of the tide flows into the lagoons. It was in these lagoons that a large number of dead Auriculae like forms were observed. Two species were identified & probably the two or three accredited to this island.

About 3 miles inland on beside the trail some half dozen

Bulimulus-like land shells were taken under logs. They were in a state of hibernation & most of them immature. Quite a number of dead mature shells were noticed in the same locality. The expsd position of these dead forms suggests that during the rainy season they are found on the few low bushes of this rather barren district.

Nov. 3,

Collect in the salt lagoons already described on the ~~first~~ lagoon just N of the first camp. The specimens of Bottle No. 41. were taken much like those of Bottle No. 40. the same species. The specimens of Bottle No. 39. were taken in the first lagoon going inland - on the left. Birded seperately for the afternoon they observ. The two lagoon are about 1 mile apart. Those of Bottle No. 40. were handed me by Mr. Ricks. who secured them in a salt lagoon some eight miles to the westward of their anchorage. They also suggest a variation in another species their relation to the species accompanying will be interesting if any prove correct an error in determination made by the first collectors.

Albemarle.

Villa Mills.

March. 5-10, 1906.

The important part of this visit was the complete ascent to the summit of the great crater situated directly inland from the anchorage. Owing to the ~~Port of the~~ generosity of Senor Bill, the owner of the Platalaia, the writer was provided with a ~~mule~~ good, saddle mule & guide

For the first 3 or 4 miles inland the trail leads over the almost barren lava fields, dotted only by a sparse growth of cacti & small bushes. After this distance the gradual rise begins. Cacti become more numerous & larger; bushes become more plenty yet & small trees are in evidence; until at ~~about~~ 3500 ft. alt. the cacti begin to disappear. Then for some 500 ft. rise in alt. there is a sort of transition between the cacti growth dry belt into the truly green and wooded zone.

From the 4000 ft. level the upward the lava takes on a more and more complete character of breakdown &

from a inch black soil. This is in fact the wooded zone; the deep rich green fern which carbs so restful from the access. Bushes & trees grow in great ~~profusion~~ luxuriance. The prickly, waxen-leaved castilla and the wild heliotrope are everywhere. At about 700-800 ft. alt. on finds the best growth of the ~~tall~~ great spreading forest trees. (Plentiful vines of morning glory & mistletoe)

At 1000 ft. the dense growth of the wooded zone begins to dwindle. At 1200 ft. only a few large bushes of heliotrope persist & at 1300 ft. one is well into the grassy zone.

The grassy zone is characterised by a tall, heavy bladed grass which covers the whole upper ~~plateau~~ lands territory with a beautiful coat of light green. In some places there are a few low bushes, mostly of heliotrope, and again large patches of isolated plants & tall ferns. This zone extends to the edge of the rim of the great crater & completely hides the harsh, rocky nature of its interior. Indeed & Cook at this fertile grassy fields with only an occasional small rocks. one would hardly imagine

Albemarle

that just meet the apparent ridge, ~~the plain~~ of the ~~crater~~ is a great crater within two large solfataric fonts still in action. Extending down into the crater is a dense growth of grass & tree ferns. the ferns seeming to flourish best on the very steep inside of the inside of the rim.

To recapitulate:

0 - 350 ft. 1st.
350 - 400 ft. transition.
400 - 1300 ft. 2nd. & wooded.
1300 - 3100 ft. 3rd. & grassy.

A few shell specimens have been taken from the first zone, needless to say.

From 500 - 700 ft. a number of specimens were taken. They were found adhering to the leaves of a small bush like plant, probably a heliotrope. All the specimens taken were taken from this particular plant.

(These forms are enclosed in the cheese cloth bag in Vl. 7 Bottle No. 66).

At 2000 ft. alt. the first

shells of the grassy zone were taken. They were the large hazel-brown Succinia. From this level to the rim of the crater the shells steadily increased in number & in species until the very rim itself where they were perhaps the most numerous. All species contained in Bottle No. 6le. were found here. all of them on the ~~base~~ blades of the tall grass, with the exception of the little Suffrya. or Vertigo like Jonas which were taken from the loose soil at the roots of the grass.

A peculiar circumstance was observed in the occurrence of the corrugated base B. Jonas. At about 2400 ft. alt. the first of them were taken. Their color was brownish, with a distinct stripe & usually a pinkish apex. As the top was approached other similar forms were taken. These latter were larger & the ~~plicatus~~ ridges of the base more pronounced, while the almost white colored, large, ~~&~~ Jonas ~~is~~ were abundant on the very rim of the crater & seemed almost confined to it.

Subsequent work here may yield some good environmental variation ideas.)

Albemarle.

March. 12, 1906

For several miles along the S. coast of the island W. J. Villa Wills is an almost continuous mangrove swamp. I was in the dark, but recesses of this swamp that a number of large Auriculidae like pulmonates were taken. They were found reposing on the young shoots of the mangrove & under the dead leaves which covered the soft mud along the margin of the lagoon. Their habitat was confined to the strip of territory beginning at the water's edge & ~~extending~~ back for about 4 or 5 ft. in the ~~trees & resting~~ ~~with~~ ~~of the moist soil~~ and the whole border of the lagoon. The water of the marsh was entirely fresh and drinkable.

The species may be different from the specimens given me by Mr. Beals when he came within a few miles of this point the last visit.

This same day I collected a few dead specimens of B. Jonesi from under stones. They look

like the specimens taken from the first one one dist. inland from Villa Nueva.

~~Also~~ Though the dead specimens were numerous no live ones were obtained.

March. 15, 1906.

Visit another in the neighborhood of district 3 miles west of Cape Rod. Slope of lava is fairly recent. but quite covered with a growth of fine large. apple bearing trees, cacti. & vines. At this time everything is green & fresh. Vegetation has come in from mt. to W.

Noticed a number of dead shells under stones they are the same as those taken on Feb. 12. at landing one miles E. of this point. No live ones. taken.

Should be mentioned here that for the past two weeks this S. & S.E. end of the island has been visited by a number of rain showers, quite heavy, though of short duration.

March. 17. 1906 Iguana Cove.

The great mountain which backs up this cove rises in one mass of tropical green, beginning at the very water's edge. The vegetation is the typical "green one" of the other islands. Only a short distance from the coast, just as close as the jungle leaves room for the actual coast mile permit. one finds a

Albemarle.

tall grass, similar to our own timothy hay. Then the green bushes so characteristic of the high altitude began to grow in abundance, the vines were green & plentiful. Ferns were in abundance both as to species & number - even the delicate "maiden-hair" grew in profusion. Everywhere is the marks of luxurious vegetation. The soil is deep & rich, though filled with protruding rocks.

The land shell which was taken in attendance these strange animals was plentiful. All the collecting was done at 200-250 ft. alt. The shells taken were stationed under the loose dead leaves lying on the ground, & were especially numerous in the shade of bushes & rocks over where the soil remained almost continually damp.

The species taken were a small Bulimulus, one specimen of Succinea, ~~sp~~, specimen of Pupa - & possibly 3 species of the Subfyra or Helix like form. Of these last. There is the hunter - Tan & lined one, then a dark

elevated apex. Then a small many ribbed flat variety. Species determination should be carried out. These ideas.

The Balanophora is remarkable for its epidermis structure: the little hairy knots like the epidermis of a Cereus.

Specimens are in Bottle No. 69.

March 19, 1906.

Up the mt. side & alt. of 700 ft.

Same general conditions prevail. A few exceptions of the Burseras, characters of the usual dry zone are mixed in the green.

The specimens taken are much the same as those of the 17th. inst. ~~except that~~ The station gradually changes the higher one goes up the mt.: more & more the shells come out from under the leaves, first to come over the exposed surface of the dead & higher on the green leaves of live plants. This is true of all the specimens taken, (Bottle No. 76.) and may be accounted for in the greater precipitation of water higher up. During the middle of the day a slow, light rain fell. From the 700 ft. level upward the S.E. side is almost ~~entirely~~ cloud bedecked. This

Albemarle.

altitude & region of fog is one of almost constant mist & precipitation.

This last statement may be true for the cooler year, for Mr. Beebe reports that the summit & upper regions are almost constantly hidden in fog — quite true of our own region in this neighborhood, but must be partly attributed to the rainy season.

The excellent condition of advanced lava break-down may be used as an reason for excellent green here, & some particular ~~altitude~~ property of the light mtd. in producing the necessary storm centre or area of low barometer. This idea may be further expanded by an inquiry into the effect of the evident meeting points of the warm & cool currents very close to this region :— shown by the first great drop in the temp. of water to air, and at the same time rainy in Bogue during the day. (Refer to marine temp. list.)

March. 21, 1906. Iguana Cay.

Investigations of the lower levels yielded an important observation on station variation according to environment. Collecting was confined to altitudes varying from 15 - 60 ft. and on the very steep slope of the mountain escarpment where it dropped off to the one & small horizontal area bounding the cove on the S.E. & E. Owing to the large angle of slope, & the rocky nature of this ~~part~~ Territory the vegetation was very thin, consisting mainly of a few bushes, trailing vines and grass. The specimens taken are identical with those of the higher elevations but were all secured from under loose lava blocks.

This example is a fine illustration of a actual choice in station in response to the limitations & exactions of the particular environment they would inhabit. This also agrees with the condition first noted that with the gradual rise in elevation they left their secluded position under the leaves, becoming more & more exposed until they were found on the leaves of the grasses & bushes. This last station may be considered the True one.

(A very noticeable trait in their station under the stones & the colorings of the shells were eminently protective.

(Oracle No. 71.)

Albemarle

Tagus Cone.

March. 25, 1906.

Ascent of the mt. back of the cone. Beginning at the pass of the crater for a distance of 1½ miles directly inland is a level plain, ~~where~~ the trail being bounded on the N. & S. by two red tufa cones. The vegetation is thin, and characteristically the first one. The soil is ~~de~~ loose dusty pilas formation resulting from the disintegration of the neighboring tufa cones. On the eastern margin of this level plain, where it ~~join~~ meets the base of the mt. a number of specimens of Pupa were taken. These shells are probably the Pupa Wolfi taken by Keller & Snodgrass etc. & specimens taken from the bases of Cotton. The specimens taken to-day in this case, were found ~~[illegible]~~ by the under sides of the dead leaves.

~~The [illegible] of the top~~ The whole western, Tagus one side of the great mountain crater, is a ~~[illegible]~~ barren lava furrowed, thinly vegetated, rise

The Thin vegetation exists in the form of small vegetation islands ~~& bands~~ some circular. Others long & radium; but the whole is given a vegetated appearance from a distance due to the merging in effects of the encroachment of vegetation on the more recent lava flows.

At an altitude of 1,500 ft. the first live B. were observed. They were found under the barks of prostate ~~Cactus~~ cacti, under dead leaves & in the base of rosulate bromeliads. They were accompanied in the same stations by the Papa Wolfi. ~~First~~ A member of the dead B. were first observed ~~at about~~ in the same territory from which Papa Wolfi were taken.

From the 1500 ft. elevation the number of dead B. seemed to increase perceptibly, & the live ones were taken quite often, from similar stations & those just cited. Also the first Bolividae - Bs from were taken about 2200 ft. alt. with others.

With the ascent. There was a little change in the vegetation; at ~~3000~~ 3700 ft. ~~the~~ bromeliads became quite numerous. & ~~Cacti~~ shrubs began to a few cacti.

At the very rim of the crater a numerous & sudden change in the growth

Albemarle
Togus One

Here there is a thick growth of bushes tall grass & weeds, all just green plants, which forms a belt averaging 50-100 yds. wide & sweeping to encircle the knoll summit. All was in this thicket. felt that all the collecting was done. The shells occur in abundance in the same relation that they occur in the specimen bottle with an exception "They were all taken from under leaves. & must generally at the base of the tall tufts of grass. The large Succinia was taken from the bases of trailing vines. All the specimens were in an active condition.

The surroundings were much like those characteristic green zone. Dense fogs often clung about the summit. Heavy dews & very cool nights were the rule. The night of our visit was chilly, temperature possibly 60° - 65° F.

Alt. of center 4000 ft.

Simply a field analysis seems to yield the following species.

B. acutus. var. J jacobi.
B. tanneri, (probably)
S. orbis.
S. Bettii.
Vitrea, actinophora.
Succinea,
Helix. — large. flat
Pupa.

The last two are the notable acquisitions & the species must be carefully searched & determined etc.

April. 2-3. 1906. (there is a)

As already stated ~~the~~ V B. form which occurs dead in large numbers on the 350 ft. elevation & then continues upward to the very top of the crater. The period of this date was given to an investigation of the limits of this form. No live specimens were obtained on the 350 ft. level where the first dead forms were observed., At 750 ft. the first were obtained. From this alt. upward the number of live shells increased, as shown by the added care in collecting.

Albemarle.

tagus cove

At 1600 ft. considerable time was given to the territory. ~~Albemarle~~ At this elevation the lizard forms are quite numerous, but the relative number of dead is small. They were taken from the under side of loose lava fragments, and seemed in a half hibernation half active state. Those actually attached to the lava blocks had the thin ~~membrane~~ aperture enclosing membrane. Some were quite loose in the thin leaf mold & others attached to little twigs scattered throughout the ligher soil. These latter specimens were in an active condition. From this it would appear that this is the closing time in the ~~season~~ damp season (better called "damp" rather than rainy) & that the shells are beginning to assume their hibernation stations. (No. 757)

Together with the Bulimulus specimens a number of Pupa were taken. Bottle No. 774 contains the specimens taken low down. Near at 1600 ft. The Pupas taken were apparently of the two species

the are: the blunt variety of the lower levels the other the longer & acute variety of the high elevations. (If it can be proven that they are in reality two species this elevation will mark the meeting place

The specimens of Pupa like the B. were found under stones, in the loose soil, and in ~~the~~ additions were quite numerous under the leaves of ~~cacti~~ cactus. being scattered about the ground. Most of them were in a state of hibernation. Their number alive bears about the same relation & the dead that the B. do.

It was a surprise to find the live Succinea specimens which are enclosed with the Pupas (No. 76). A number of dead ~~shells~~ forms had been observed at 5000 ft. & D. but no living ones. The specimens were glued fast & the under side of the lava fragments.

Their station would indicate that this is about their lower limit & that due to the more strenuous exacting of this lower level they were forced to take this more protected position.

Protective coloring

Regarding the idea of protective coloring the specimens taken at 7000 ft. A.D. were especially noticeable for this feature.

Albemarle.

Tagus Cove.

These B. hidden under the paler barks were usually of the easily distinguished brownish tube. These under leaves & rocks took on the variegated light gray shading to dark ian parts.

The Succinea forms in their dark bodies almost black bodies against the blacks of the lava were distinguished with difficulty - indeed the collector must needs look close & be patient & search each part of the rock with a close scrutiny.

Even the minute forms of the Pupa area aside from their inconspicuous size were well chosen to deceive the eye.

Vegetation.

Beside the thin vegetation of the just one one tall grass & other annuals covered the otherwise bare ground to relieve it somewhat of the barren aspect. (1600 ft.)

The added green of this alt. is made possible by the mixed tufa & lava origin of the thin soil.

April 7, 1906.

Visited the 250-300 ft. knoll which forms a sort of very gradual plane at the foot of the petrified forest, & lying in direct path of the usual route, & the Ariz. Santa Fe railroad for a distance of about 1½ miles one arrives at an almost perpendicular wall of lava some 10 ft. high, which was formed by the sudden termination of the lava flow at this point. The territory just crossed is a brownish, sandy, & almost completely barren tract, the result of a light tufaceous stratum decayed. Arriving at the lava wall, one finds that the flow is quite divided in fact 2 flows of diff. age, one to the southward the other to the northward. Between the two flows is a peninsular like shaped island of vegetation which has escaped the ravages of the fiery flow. Climbing the flow, and proceeding into this territory the attention is quickly called to the bright, sandy soil of the area, & which seems responsible for the relatively fine growth of bushes & low trees. The soil is that which has resulted from the breakdown of an older & differently constituted tufa one.

Albemarle

Tagus One

This soil in comparison to that ~~first~~ passed is decidedly good. (Old tufa)

This territory that particularly observed marks a bite area. Once into the ~~Albe~~ territory one notices the great number of dead, bleached Bulimulus forms lying about. Some Succineas & Pupas are also to be noted. Thus in this abrupt elevation of 1 to 1,000 ft. a change in soil, an increase of vegetable & we have the life zone on the one hand & the lack of it on the other.

Collecting in this area yielded numerous Pupas, a few Bulimulus & some dead Succineas. The live ones taken were all in a state of hibernation. Their station was in the rotten logs & branches lying scattered about. Sudgrass to Keller report these shells as taken from the leaves of Rotan. This diff. in station is probably due to the fact that this is properly the beginning & well into the dry season. This is indicated by the condition of hibernation. From

the observations of the habits of the shells on these islands, especially Charles it is shown that during the dry season they leave their exposed stations to select more protected ones.

The sudden separation of the two life areas is well defined. The lava does not end there completely. the little vegetation of the first century. Zero once Apterinella Menkeia, Lib, that the fact that the Succinea are all dead, & B. numerous or, that these are probably changing conditions more recent.

Albemarle

Banks Bay.

April. 9-16-1906

Beginning at the coast & proceeding inland one finds the country divided: a ~~barr~~ dusky, thinly vegetated, dry territory ~~about~~ 1½ - 2½ miles wide & extending inland 3 miles & the base of the crater itself; a wide lava field bounding this vegetated area on the N.: a similar lava field on the south. The vegetation of the middle are is a mixture of the first one & a few plants usually found in the 2nd. or green zone; the notable additions are the large coast trees "Erythrina velutina" noted from James. & numerous Adiantum (species of), the common "maiden-hair" fern. The area had almost no rise, until it ~~plunged~~ suddenly merged into the rapid slope of the crater mountain. Strange to note there was no shell life to be observed in this territory, until at an alt. of 325 ft. slightly up on the base of the mountain. The first specimens were collected. They were taken from under old logs. ~~at the~~ & under lava blocks

The vegetation of the mountain is nicely developed into three zones:-

1. First or dry zone 0 — 1500 ft.
2. 2nd. or green " 1500 - 3000. ft. about
3. 3rd. or brown " 3000 - 4300 ft. about

The first zone gradually becomes denser until at 1500 ft. the green zone is in full possession. This green belt is the most quite the ~~one~~ dense green of S. clusiefolia possible for instance, but bds many of the plants & the general appearance characteristic of the green belt.

At 1500 ft. & from thence upward to an alt. of 2300 ft., the limit of actual exploration, a number of B. & S. zones were taken. They were selected from the leaves & dry stem branches of the grasses & bushes. With the increase in altitude the zone became more abundant. They became abundant until at 2300 ft. They were abundant. (Bottle No. 74.)

Though the brown zone was not visited it was approached closely enough to see its constitution & limits. It was found to be a tall brown grass, interspersed with tall ferns & dwarfed bushes.

Steep slope, great development of vegetation to be attributed to the particular soil & soil ~~de~~ drainage. Note

Albemarle, Cowley. Mt.

Aug. 10 & 11.

Land opposite the island & go inland over the great pumice fields. The light vesicular and acid composition of the pumice will not permit of vegetation growth until the higher altitudes are reached where the basaltic flows form above & the complete breakdown of the pumice together with the increased moisture precipitation. Plant growth becomes plentyful. Real abundant vegetation begins at about 2100 ft alt. whence it increases to a complete density of the usual greenery of high old mountain tops.

The shell specimens of No. 114 were taken at 2100 to 2300 ft. Alt. from under dead wood lieing prostrate on the ground.

The plant life of this zone is characterised by:-

1. Senna, Orchids, Castella, Berseria, Cissampelos (the long vine) and tall grass. Heliotrope?

Spurs S or S.E. & N & N N W. The angle of general slope is about 12°-14°.

Cissampelos

The species indicate the following genera: Succinea, Pupa, Vertigo, Helix, and Bulimulus. and in species they are much like those from the Villa Nil mountain - if not identical.

Although the specimens were all taken from under dead wood - it is reasonable to assume that their true station is on the bushes & leaves of vines etc.

This conclusion is quite a logical one when we consider the same condition as found to be true at Iguana Cove & the Villa Nil mts. - also at Banks's Bay & Tagus Cove etc. Even two three specimens were taken from under the bushes protection of the pistonia & orchids.

The specimens & their position illustrate the great adaptability of these animals to seek the position suitable will protect them from exposure ~~in the~~ during the unorganized period of the day & cool season. Dead ~~specimens~~ grass & dried plants generally show the winter season or hot season. Then the abundance of the delicate Succinea indicate its station during the rainy season.

Dead specimens of shells under first

with beginning of rainy season. Tagus Cove

Albemarle. Cowley Nos.

at about 1200 ft alt. together with the beginning of the low bush. Opuntia! The dead specimens at this height were the single species of Bulimulus taken alone. Their corrugated bases indicate the extreme hardihood & great adaptability of this species and particularly of this genera, in existing under the most diverse conditions.

The comparison of the respective corrugation, that is its variation according to station, in this species will afford an interesting study.

It ought to form the basis for an important generalization on "variation according to surrounding and environment". Of which the probable study of the Galapagos mollusca furnish a noteworthy

Albemarle. (Villamil.)

Aug. 20 – Sept. 5.

This is the winter season and all the shells have taken to their most obscure stations and are in a state of hibernation. At this time of the year the whole mountain elevation is visited by heavy fogs which produce a sort of thin rain like drizzle sufficient to wet the grass & trees, but not producing any running water.

The species of B. occurring in the dry zone is probably the "jacobi" so common & this island. Its range is from the sea shore to about 450 ft. alt. – near the upper limit of the cactus – which limit is approximately ~~500~~. 525'. The small blunt pointed Pupa probably "wolfi," though a true dry zone shell does not extend so high, probably not more than 350' alt. The dry zone Succinea, has its farthest lower limit in the sandy, ~~arid~~ bush-grown soil of an old beach. The limits of this shell's ~~zone~~ are probably as narrow as the Pupa, but

the dead shells in station were all that could be obtained.

The green zone proper extends from about 550'-600' to 1200' alt. belt. The lower is the chaparral brush. pine etc. giving place higher up to the tall forest trees - with little underbrush and the deep litter limit the trees diverse in size and brush increases again - finally & merge into the almost treeless grassy zone at about 1800' alt. The green zone is divided into two true molluscan life belts. The first it that represented by the specimens of bottle No. 117, ~~480'-800'~~ (480'-700' alt.) The second zone the belt represented by 480'-1300' alt. which belt the specimens of No. 116.

Thus the 2nd zone begins with the first & then continues & the upper limit of the green zone. The live specimens of No. 116 are found abundant at 1000'-1300' alt.

The large Succinea characteristic of the upper grassy zone has its beginning at about 1300'. - some few specimens are found as low as 1100' but it properly has its beginning at 1300'. The observed occurrence of this species

must be taken from the March notes. - this time being winter the specimens are quite generally hidden.

The rim of the great crater seems to afford the ~~gulch~~ proper conditions for shell life. Here within the space of less than 100' alt. there are gathered at least 5 species: - S. B. & P. + Y. + H. etc.

As stated - this being the winter season almost all the shells were hidden and not to be found in their usual station

The single specimen of No. 119 was taken by Mr. Williams just above the base and at an alt. of about 7300'.

Charles Island.

Oct. 4. Goashore in Post Office Bay. Work S. on a steady rise. At 150 ft. elevation find the first signs of land shells - all dead. Work up to the summit & 2nd. crater to the S. Quite a few dead shells are seen at 275 ft. but no live forms. Work upward to a height of c 675 ft.; all the way ~~find~~ upward plenty of dead forms were found under the stones, but no live ones. Mr. Slevin handed me some half dog. live shells, which he had taken from under a stone at an altitude of 300 ft. They were in a state of hibernation - glued fast to each other & the stone. The forms are much like the ones taken on Gardner & Champion, but differ in being smaller & lacking the banded appearance. It may prove a ~~same~~ different species from the Gardner & Champion forms.

Oct. 5. Visit the flamingo lagoon near Cormorant Bay. - search for salt marsh shells, but do not find any. In the evening Mr. Slevin & Mr. Williams hand me some 8 or 10 live shells secured on a rise of ground just back (S.) of the lagoon. These shells embrace ~~the~~ three or perhaps three species. are in a state of hibernation; were taken

from under the rocks & at an elevation of perhaps 75 to 90 ft. They report the shells as extremely scarce, for they worked all day turning over stones looking for "geckos" & these were all they found — something of my experience of the day before.

Oct. 6. Go ashore at the flamingo lagoon. Collect land shells in the territory just south of the east end of the pond. Here at an altitude of perhaps 75-78. I secured about 40 specimens of live land shells. Their station was under comparatively loose & shallow blocks of lava, glued to the under side. Sometimes they were found by scraping away the loose stones - lying in their retreats in the interstices of the loose pebbles. At the same time about 35 dead shells were taken from the same region & occurring along with the live ones. Taken for what they are worth.

Specimen numbers 13 & 14. Probably two species. It is to be noted that these shells occur in a exceedingly rough & arid station. They are prettily polished.

Noticed quite an amt. of drift material in the cove at the sand dune (S.E) end of the lagoon.

Blackbeach Road - Charles Island.

0

Oct. 7. Go ashore at the settlement. Follow the trail inland in a E. by S. direction. Beginning at the 100 ft. level shells were obtained under lava blocks. They were glued to the under surface after the manner of the other specimens in this station. Though similar to the P. O. Bay. species. they show some difference which may result in one or two additional species. Continuing upward to about the 300 ft. level the same forms were obtained. Bot. 16.

From the 300 ft. level to about 500-675 ft. level there seemed only a few shells - almost none. all at once on this last named alt. Mr. Williams (& I) noticed some large shells ~~clustered~~ adhered to the stems & small bushes. Upon investigation it was seen that ~~the~~ at the base of the bush, just where it left the ground, great numbers of shells were clustered. all quite firmly glued together - as many as 5 or 6 in one bunch. From now on up the trail the shells were in a great abundance. They

seemed to be almost everywhere - under old rotten logs, stumps, stones, ~~even~~ on the stalks of small bushes; even on the inner side of old cow skulls. (Can RRg. No. 15)

At about the 900 ft. level the first Succineas were observed. They were small, dirty, black forms, glued to the under side of small loose lava blocks. (Bot. 19)

A short distance further up the trail the large, purplish Succinea was taken (Bt. No. 17) These were especially wide awake, though quite in a state of rest on the stems & leaves of the small trees & bushes. They immediately exhibited lively activity after being removed from the leaves. They were quite numerous at the 1000 ft. level & continued so on the rise of ground which formed a sort of divide between the N.W. & the S.E. depressions, & connecting the two high points, one on the W. (1760 ft. alt.) & the other on the E. at this same level another form was quite in evidence, attached to the stems & leaves of the bushes along with the Succinea. ~~No specimens were taken of this, but~~ In appearance they are much like the ones taken from the rocks & rotten logs

~~No~~ No. Specimens were taken from this.
(~~but~~ Probably will be taken on Monday).

Mr. Stewart visited the Crater on the top of the 1780 ft. elevation. On this crater he reports an abundance of shells & quite moist ground with ferns, lichens etc. in abundance. This will probably be an object point of another tramp inland!

He estimates about 4 zones of vegetation:—

vegetation to 300 ft. ~~& acacia & coral~~
300 ft. & 600-700 ft.—

0 — 600 ft. — acacia & bigenus.
600 — 1000 — ~~con~~ pitae - euphorbacia. & mistletoe.
1000 — 1400 ft. — larger growth,
~~1400~~ absence of euphorbacia
1400 - 1780 — no bushes, but grasses & ferns & crates.

This agrees in part with what Dan's words has produced.

It is to be noted that these observations are taken from the N. & N.W. side - the lee side according to the direction of the ~~wind~~ assumed prevalent winds.

508 320

Oct. 9.

Worked inland ~~to~~ E. by S. side of high point where I began towards the top. Began collecting at ~~2~~ 1,100 ft. At this point I first noticed a number of Succinia upon the leaves of the small bushes. At this same alt. too. I found the first specimens of a smooth, light brown (hazel), univalved, B. shaped shell (Bottle No. 22) These smooth forms (No 22) were scanty in number & occurred with the very common varied colored (B. (~~Case~~ No. 15.) glued to the under side of loose lava blocks. They attracted my attention as being something quite different from the B. collected on the 3 at. before. As I worked toward the high point the Succinia became more abundant & larger in size. Especially was this true on the S.E. side of the volcanic one just at the margin of the breaks in the crater. The crater having it's side broken out on it's S.E. margin. About 1,500 ft. alt. the S. seemed less abundant. but probably due to lack of proper vegetation. When I reached the summit I descended a short distance into the crater, this point being the ~~south~~ N. side of the crater. At this point the Succinia

were quite abundant, but seemed of a darker shade. These ~~~~ were taken & placed in a ~~~~ special vial (Bottle No. 22) 23(?). The altitude was about ~~1750~~ 1700 ft. - only a short distance from the highest point. This alt. (~~1750~~ 1700 ft.) is the extreme upper limit of vegetation - indeed the S. were restricted on the leaves of the small herbaceous, - the first of the rather dense growth of the moist & shaded.

The progress of my growth B. (No. 22) was very interesting. Working slowly toward the summit it was observed that the number of these forms steadily increased while at the same time the vari colored B. (No. 15) it's accompanying member, in their home on the under side of the rocks, became less & less in number. At the summit (1780 ft.) the No. 22. type was the predominating form - indeed almost an absence of the other, & these still persisting - had become very small. These specimens the No. 22 type, with its accompanying vari colored (B. (No 15)

are placed in the upper half of (Can No. 21)
It will be noticed that the small B. (No 15)
type are less numerous occur at the ~~of~~
~~the~~ bottom of the upper half of the pan.
due & their being collected last.
All of the specimens thought in a quiescent
state became immediately active when
removed from their fixed position. For
this reason it was necessary to kill them
with alcohol. Their nature & structure
& stones or leaves is very blended. In most
cases it is merely an extremely fine web
like membrane. This film fills the small
~~interstices~~ interstices between the edge of the
shell & the small ~~roots~~ irregularities of the
stone ~~or leaves~~.
The inside of the crater was indeed a surprise.
It was pen down the 1200 ft. level on the
S.E. side thus allowing the mist winds & time
in & make the crater a perfect little tropical
forest (like Queens on a small scale.) During
the day large clouds of mist floated up
over the crater & summit. even & subsequently
~~being formed~~ & from rain drops from
the leaves of the plants.

Oct. 10

Worked on the mountain S. of the light point. At its northern side ~~is a~~ are ~~small~~ two small spring holes - formed by a seepage through the absorbitute & pteutine rhyolite. This mt. is marked by its abundant vegetation - the green of the foliage is apparent from the ocean. It was immediately in the neighborhood of this spot with both that Mr. Nilliams found a single dead specimen of a Septiaria. Abe shell (Pkg. 27.).

Beginning at the spring (alt. 1000 ft) actual collecting began. There was an abundance of Succinia (Bottle No. 24) upon the leaves of the small ~~tree~~ bushes. They were quite active - due to the rather plentyful moisture which ppts. at this ~~time~~ place. During the actual time of collecting a heavy fog hung over the place & its condensation made the leaves drip.

Beginning with the 1000 ft. level the Succinia were accompanied by a small (B. like form (Bottle No. 25)

For 200 ft. upward the two forms were found side by side on the stems & leaves, when the B. forms ~~suddenly left off~~ became far less abundant. ~~Collecting~~ in fact it seemed to disappear. Collecting was carried on to the summit (alt. 1650 ft.), when the two were again companions. At this point a striking illustration of variation was easily apparent; the B. forms were now very numerous and instead of the pale, almost white color of the lower forms they were quite colored; a great many being of a dark hazel brown. The Succinia & B. were found together under the edges of the small stones, under the moss, at the base of the small bushes & grass tufts. It was further noticed that the B. forms deepest under the moss or wet leaves were the ones having the darkest color. This last seemed an invariable rule. For purposes of comparison the two alt. forms are separated in the bottles - the lower alt. being No 25 & the high alt. ~~1600 ft~~ (1,650 ft) in No. 26. The forms of Nos. 25 & 26 will probably prove to be diff. from the ~~forms~~

species thus far collected.

Oct. 11.

Spent part of the A. M. in collecting on the lower levels. The shells are rather rare. Only secured the few in Bottle 29. These were taken under the lava blocks, glued in an excellent state of hibernation. The surroundings were that characteristic of the first belt:- acacias & legumes, dry grass & a few small bushes. all taken within 50- ~~40~~ 500 ft. altitude. There are probably three diff. species included a few good dead specimens & further increase the series.

Proceeded to the 2nd. belt & spent the rest of day here. Segregated the very abundant B. Jonis by taking those on the stems & leaves of small trees (Bottle No. ~~20~~ 28) & those under the stones (Bottle No. 30). On working with the No. 28 types it was found that at the ~~lower~~ lower limit of the belt of collection the Jonis were very pale & seemed to have bronzy & bleached appearance:- probably due to their open position

the lack of the bushes & the lee (N.W.) side of the high & broad. 1780 ft. zone. It may be that they will lose this bleached appearance when placed in the bottle, but the apparent difference should be noted. alt. 750-950-1000.

Bottle No. 30. was the result of collecting in the same zone. They were taken Jan. under the rocks & were the most abundant. alt. about 750 ft. alt. It may be that these forms may be shown to intergrade between No. 28. & No. 30. in which case there may be something in the sizes; their selection this means as a protection in the more open surrounding & the lower limit.

Collecting along with No. 28. the Succinia Bottle No. 31. were taken alt. 800-1000.

During the days at this anchorage it was observed that each morning & for a great part of the forenoon the high points were hidden & bathed in moist clouds. This is important as a reason for the shell life & plant life higher up.

~~Chatham~~

Charles

~~Should~~

Feb. 26. '06. Cormorant & Post Office Bay

The territory just back of these two bays is now quite green. due to the recent showers. During the past two days we have experienced two quite heavy showers (past duration). The vegetation seems entirely of the first zone. with perhaps a little Tundra toward the 2nd. on the higher elevations. (It will be safe to leave it at this for the chart zones) As well as being in the lee of the weather this side shows some recent volcanic activity. The region just back of the salt lagoon exhibits recent action and much of the territory is a light cinder. like lava upon which the cactus & some of the other border members of the first zone are taking a foothold. The large bluff like promontory forming the N.E. projection is composed of the yellow tufa characteristic of outlying islands & points. The region just back of Post Office Bay, [illegible] & the peninsula which forms the

western border of the bay. ~~It~~ seems quite old. in fact much in keeping with the same elevation taken inland from Black Beach Road. allowing for the ~~protected~~ its retired position.

Feb. 26 – March 2. 1906

Bladsbeach Road.

Going inland over the trail & traversing the vertical altitude which put the first 3 life zones, a general scarcity of shell life was noticed. The same species which once formed the station for the shells were now barren of life except perhaps a single specimen or two. The old lodging places, such as the ~~sam~~ sand shell & the old logs were almost entirely deserted. These last two stations held thousands of the little inhabitants in the hibernating condition at the time of the last visit. Only a few Succinia were taken. The green leaped bushes were almost totally without the adornment of these pretty shells - and in places where numerous specimens were taken ~~to~~ only 5 months before. A great increase in the number of dead, bleached shells ~~was~~ was noticed - especially among the Succinia.

This is the rainy season. The spring trace of this region. During the first few

Charles.

hours of ~~the~~ each day of the visit. a fairly heavy rain fell. The rest of the day was clear & warm. All of the trees showed the advent of spring; the little bushes were all leafed out; the acacias were green; some of the legumes were in blossom; small weeds had sprung up everywhere quite profusely mixed with yellow & pink flowers. The turtle or grassy knoll was in fact a green-a beautiful green cap on the mountain top.

While ~~---~~ exploring the territory X the S. E. a few specimens were taken from the under side of fungi. the plate of the plant being grown & the base of a large lemon tree. The territory was a close growth of bunya bunya, dark soil ~~---~~ with no undergrowth. The specimens seem different from any taken thus far & may prove X to be new.

The same territory yielded a great number of dead Lepidoptera. They were notable because of their great size - some of them fully three

as large as any live specimens taken.
(Ibis 1866. 65) A.O.U. 750.

Charles

Blackbeach Rd. May. 14-17, 1906

At this season the country presents a dry & parched appearance. All the grasses and annuals were quite dry, with only a few of the pale green Cotton & Isocoma & alter the prevailing brown. This is the dry season in earnest, the hibernating time for the shell fauna.

At 675 ft. alt. where the shells were taken at the time of the first visit, I was greeted by some small bushes quite clustered with numerous shells. The shells of this level are noticeable for their general grayish gray & bleached appearance.

With the gradual rise in alt. the shells became more numerous. The Cotton bushes seemed the favorite station. On these bushes they were glued to the stem & leaves, in rows & clusters. At 900 - 1100 ft. they reached their maximum in numbers & in species. The under side of the loose lava blocks were liberally sprinkled. A few Succinea were present and also a few of the

332

smooth thin shelled species. Besides the Artus a few were taken from the mossy stems of Castella. At this higher elevation the specimens are marked for their greater brilliancy of coloring & color variation.

The glacial element gave which covers the ~~vicinity~~ fertile parts of the coble S.E & S. & S.W. parts of the island does not offer much in the way of shell life. Great numbers of dead Sideneas, however, are sprinkled over the ground. A few live specimens of this genus were taken from the bark & leaves of the trees.

One or two species ~~the~~ a thin, ~~shell~~ smooth shelled species of B. ~~was~~ is numerous. They were taken from under rotten wood. (This is the same as the one taken from fungi during the March visit)

May 3 & 4. 1906

Many specimens of Septuaria were taken. Only found under damp stones at the lower spring, Spring NO., within a determined radius of a few yards. Shells were resting on & in the soft, black, moist soil. Apex of 3 or 4 coils are dark, almost black. Almost all in an active state.

(Enlarge on immediate environment)

Always damp.; ferns, 1000 ft. alt.; etc.

Mule & cattle trails interfere with spread & abundance.

Charles

May. 25, 1906.

Some albuburni given the shells of the first two days ones. The specimens were all found liberating under loose lava blocks & higher under & in old pottery logs. The real belt of distributions seems about 200-450. Sparingly below 200 ft. a few are in endurance; all under stress at 450 only a few remain & what was the real belt below & ~~all~~ most of them are in pottery wood. It seems marvelous indeed that within 50 ft. of all. There just one shells shriveled disappear and the upper or nine superday. The middle zones to have their beginning. — at first alive with a single species & then waxpurpurel at 500-800 — 1000 (unit) Specimens in No. 92.

June 1. 1906

Beginning at about 500 ft. at just after the disappearance of No. 92. the specimens of No. 95

were taken - up to 625. These specimens illustrate the gradual warming of the abundant life above - but:-

1. they are pale & lack the bright coloration of the higher shells;

2. they are not common, but gradually become more numerous;

3. their station begins with a above position at the base of small bushes & grasses close to or on the ground & possibly more prominent heights in the stems.

4. there is probably but a single species in a diff. in color according to prominence

5. this

To be noted

(a) The specimens present a pale & bleached appearance, quite generally but their seems a difference among the shells, in this respect, according as they have a prominent and exposed position, or one rather sheltered. Those shells reposing on the upper stalks of the bush were almost invariably bleached & additionally rugged while those on the very ground & the fresh, and those sheltered, had a pale brown color, and somewhat of a polish. These shells, taken collectively illustrate a tendency towards the close of the form:-

Charles

- snuff color - usually a dark brown
- and roughened surface

(b.) As first the shells were to noticed in scattering singles. then ~~little~~ pairs, and finally small clusters, showing the rapid change in general conditions.

At the lower limit (500') about 100 ft. I accord the shells were almost entirely confined to the small, shrub-like ~~Opuntia~~ Sarcobatus (Caparia)

(c) Sarcobatus is ~~the~~ accompanied by a taller bush ~~(Caparia)~~ Lipochaetea, to which the shells adhere with increased alt. Lipochaetea

(d.) For investigation.

(e.) Mentioned under (a)

May, 31. 06

Some interesting work on the color variation according to alt. of the small pale B. which inhabits the slopes & summit of Spring Mt.

While in the open pasture terrain of the

S.W. of Spring Mtn. a small old dried water course was met with & the attention was taken by a number of dead shells. Investigation showed that the entire water course beginning at the mtn. & extending down to 750 ft. alt. (and some below. although most of the specimens were taken from the 750 ft. alt.) was inhabited by numerous specimens of the small B. from already taken from the 1650 ft. elevation of the summit of Spring Mtn.. They were noticeable for their pale coloration, single surface & obscure position, at the base of Castella bushes (under rocks) & a few Croton plants. which by their vegetation shaded the sometime moist nature of this particular part of otherwise sun country. All the specimens of 94 this type were taken at about 750 ft. alt. — a few below. where the rapidly became less numerous.

These small B. were accompanied by a few of the large brown, thin shelled B. from found in 94. — perhaps a score of these. The great remaining series of the large brown species were taken from the great brown granite ~~&~~ the S.W. & S.E. of Spring Mtn. & at the slopes. They were found in a complete state of hibernation, resting

Charles

within the packed like spaces of rotten logs & heavy branches. They were most numerous at approximately 800 ft. alt. - in the deepest shade of the burn zone. This species is to be ranked as a shady plateau type - they extend to the top of the 1650 ft. but occupy a position generally well shaded in the moss of in-class of the moss lichens of the bases of the small boulders.

This sand condition is to be noted here from the collecting of June 2. when the summit of the 1750 ft. mt. was reached. Of course it may be shown that the two forms are dif. species. but the relative shade loving proportions will not be destroyed.

The specimens of No. 93 were taken from the summit of Spring Mt. (1693 ft.) and are intended to bring out the idea of alt. color variation as when compared to those of No. 94

The specimens enclosed in the glass bottle are from the sides of the Spring Mt. at about ~~1400~~ 1250 ft. The Specimens were on the leaves,

(upper side) of the lemm trees.

An important observation was made while working in this S. & S.E. lemm grove territory. The lowest limit of lemm grows is about 400 ft. Just ~~at about the~~ shortly before this alt. the undisturbed vegetation became similar & indicate a general working toward the condition of vegetation at 750-1000 ft. near the highest crater, where the large. variegated B. have so great a growth. Now with this S.E. exposure, for the lemm groves, & the moist winds from the prevalent direction made it possible for that growth, when introduced by the settlement nearly 100 years ago, to spread & usurp the territory held by the native flora.

The spread & growth of lemm ideas crowded out all native shrubbery to leave almost nothing else within its general confines. Under the old condition the large B. sought its counterpart in stature and individuality. With the coming of the lemm grove, however, it has been crowded out & perished. In support of this I observed a few dead

Charles.

shells of the large B. type. Two or three of these dead shells are enclosed in No. 94. At other times & other visits to this same territory some few specimens of this species were seen — always large - and dead.

Above is important in making the life zone belts & should be considered in dealing with the distribution of the large B. forms.

June. 2, 1906.

At the time of the Oct. visit it was noticed, while taking the large B. from under a rotten log that there were a number of small, slender B. forms with the large: it was believed then that they were a separate species & the work of today seems to prove that it is. The specimens taken are enclosed in No. 98. (Formalin)

All taken from a rotten log at 750 ft. alt. None were obtained higher until a specimen was taken from the E. side of the high mt. at 1200 ft. alt.

June. 2, 1906.

Walked up the side of the high mt. Began collecting at 1500 ft. alt. A few large B. were taken from the stems of the large ~~compositae~~ Leptocactus, accompanied by quite a number of the small, slender, nicely colored B. At the ~~same~~ upper limit of this vegetation, about 1600, the grassy & bunch grass began. Here the large cacti nearly disappeared, a few large thin shelled Opuntias are present. The small ones became very numerous, quite predominate. Their station is generally under the few large lava blocks which dot the ~~slope~~ grassy top of the mt. Some few specimens were clustering at the base of the largest of the grass tufts.

All the specimens of No. 99. were taken from 1500 - the top. The few S. collected were taken from under the moss & lichens hanging from the few bushes of Heliotropium which reached the top on the inside of the crater

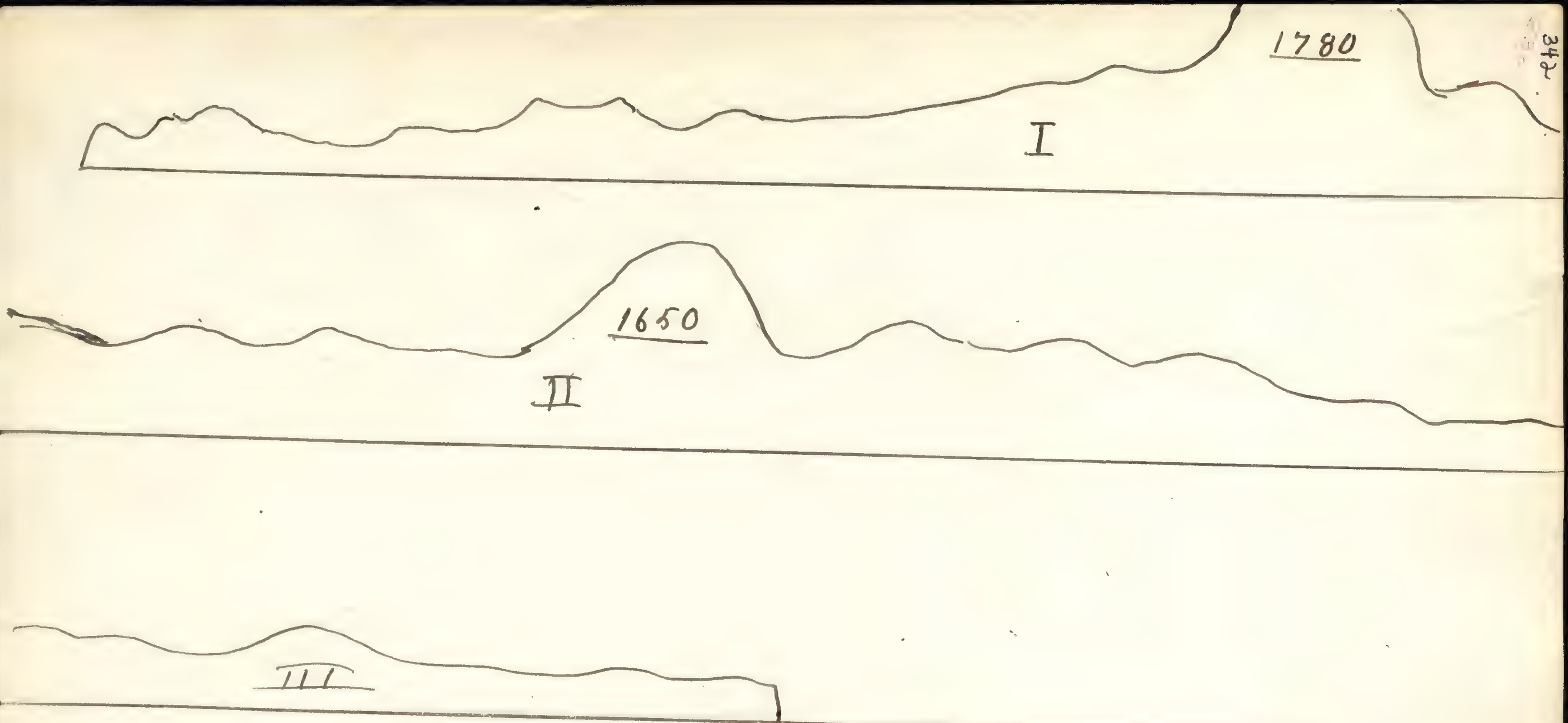
On this same date a nice series of a new species of this genus were taken. They are the specimens

Charles.

No. 104. The Jonn is that of the Vertigo. They were all taken from under the moss ~~hanging~~ on the stems of Helicotrapium, where they accompanied S.

Two or three Specimens of Pupa were also taken at the same station. They seem diff. from the Jonas taken at 7.50 & may prove a diff. Species.

Same date. A series of Pupa taken from under old shucks & bones at 7.50 P.M. also Never been taken here before. Specimens of No. 103.



Charles viewed from H Blackbeach Road.
For use in charting life zones.

Narborough.

April, 6, 1906.

Mr. Beck returns from Narborough after his successful attempt to reach the summit - rather the rim of the great crater, from the E. side; about the region of Mangrove Point directly inland. He brings me the specimens enclosed in No. 77. They were taken at 2000 ft. & thence upwards to the rim, where they were the most numerous as to species & specimens. Mr. Beck describes the plants as first: the brown B. Jones variety first in old cactus: then the other Jones appearing later in the rise & gradual progress into closer growth of vegetation; under old cactus or grass & bushes. The specimens, though they will make new records for this island, seem to resemble some of the Albemarle species already taken - & may possibly be proved the same. However a sharp lookout must be held for possible new species for this is a portion of the island

not reached by any other collector.

Vegetation:-

The vegetation for about 2000 ft. around is scant. The first 1,000 ft. is emphatically barren lava, having but a few scant single plants in the several large particular vents on the side of the great crater. Above the 1,000 ft. elevation for about 2000 ft. rise, the vegetation consists of green islands & long green strips set in the lava back-ground. This land designated territory next & that below the 1,000 ft. altitude has been the last to be visited by the ferry flow, but has broken down to allow of plant growth. This growth is thin. Their most abundant as the rise in altitude brings the lava ~~within~~ further & further within the level of fog condensation. The last 1,000 ft. or thereabouts of elevation comprises a terrace like group & the rim of the crater itself. This region is rather densely grown with tall grass, ferns, bushes etc. The thickest of the growth, below the 4000 ft. elevation, is a narrow belt about ~~the~~ & in the great rim.

Most of the plants were taken from this last environment. & may be designated according to their ~~stalk~~ that ~~of~~ the al-

Narborough

State that as the height of the island has not been determined with accuracy, but comparing it with the nearby known elevations it will be considered as approximately 4500 ft. in alt.

April. 18-19, 1906

Visited the N. coast of the island. The whole island presents a rough barren ~~the~~ recent lava surface, relieved only in spots by isolated islands of vegetation. This vegetation ~~rests~~ lies on a loose brown lava of somewhat older age than the general flows and under the influence of the greater weather erosion on the higher altitudes it has broken down & allow of more dense growth & a gradual development of what would be called the green zone of other islands.

All the collecting was confined to the dry area, while in the largest vegetation island extends a long distance inland.

The only specimens obtained were the series of Pupa, No. 81, collected from this island by Messrs. Snodgrass & H. ~~Heller~~ The specimens were all taken from

under loose lava fragments, from the roots of small bushes & under the loose damp leaves ~~which~~ of the Empetrum which had gathered in the little rock depressions & breaks in the lava surface. Nearly all were in a state of lubentation; ~~the~~ a few especially those under the damp leaves were active

Tower Island.

Sept 13. & 14.

Tower presents a drear & barren aspect. The island is low. without any rising points or small craters & breaks the even. slightly curving skyline. The islands surface is one great. unbroken lava field of recent date & activity. Away from the ~~sea~~ sinuous lava streams bone skeleton over the whole island in a gentle slope. and with such evident quietude of activity that the flows are unbroken save by a few small fissures. vents & surface tunnels. leaving the present ~~surface~~ face of the island. a smooth easily passable area. The hardy sweet scented Bursera and Cactus form the great part of the islands scanty vegetation. To ~~look~~ view these barren lava fields. one feels that all life, no matter how tenacious, must indeed bear strenuous demands.

A few ~~specimens of~~ live Pupa were taken It is not strange that such an inhospitable life is almost absent - and that the scanty minute forms have

escaped observers thus far.
Turned away under dead wood & bushes
old leaves collected at the bases of
small bushes in rocks depressions the
collector is rewarded after patient search
with a few specimens of Pupa.
The species Pupa is the
~~Pupa~~ common to the dry
arid zones of the islands. Its minute
form read of transportation explains
its presence.

Bindloe Island.

Sep. 17, 1906.

The general tufa structure and recent lava over-run, together with its low elevation (& other indications of the only recent vegetation & volcanic activity) precludes the inference that Bindloe is poor territory for molluscan life.

In the last day, sparsely vegetated tufa region of the coast a few bird specimens of Puffa were taken. They were found under & well into the crevices of rotten wood lying about the surface.

Unfortunately I could not reach the very highest elevations, where due to increased precipitation a few additional plants are found, such as ferns & lichens. Undoubtedly the two species of land shells recorded for this island are to be found in these upper levels.

Abingdon Island.

Sep. 19-22. -1906.

Generally considered in its relation
to the other islands and its intrinsic
interest. Abingdon is one of the youngest islands
The plant life is fairly, but not highly
developed into the usual prominent life
zones cited for the other large islands
of the group.

1st. 0 — 650'-700'
2nd. 700' — 1600'
3rd. 1600 — 1950

The 1st. zone is characterized by the usual
rocky, arid territory. The common plants
being Burseras, Cacti & ~~numbers~~ species
of low bush.

The 2nd. zone has an increase in the
bushes, both in number & kind. grasses
vines & the common Opuntia. ~~pear~~ cactus
The bushes are plentifully festooned
with moss. The prevailing feature of
the 2nd. zone is the dominance of
cacti. — especially on the E & N.E.
sides of the highest elevation.

I expect at the beginning that the
usual observations are taken from the

S. & S.E. ~~to~~ on which side the genera are always developed & the best & occupy their true position.

The 3rd. zone is characterized by a great. and predominating growth of ferns, grass & this ~~type~~ part of the mts a brownish cast.

The conditions of climate observed indicate this season to be the close of the winter & the opening of spring. Nearly the whole S.E. exposure of the island was bathed in a heavy drizzle like fog. which precipitated ~~quite~~ enough water to amount to a fair rainfall. During the ~~morn~~ first half of the day this fog became so dense about the top that a slow, soaking rain fell there during those hours.

Through the soil Tacle presented the belted green characteristic of the genera, the N.E. side Through the same alto. up ~~*~~ 1700' - about the highest ~~part~~ of the island on this side, was quite dry & all plant life seemed quite dead. (Mr. Beck).

~~As~~ this time of the year is quite unfavorable to a study of land molluscan life I did not meet with great success, but enough shells were obtained to give their characteristic range & distribution.

"Pupa clausa", was taken from under stones just a short distance back from the beach. Their range is limited by the beginning of the green zone. ~~Most~~ Most of the specimens were dead.

"B. jacobi". Some under stones is found soon after the beginning of the green zone. ~~at~~ at a alt. of ~~750'~~ 700'. Some specimens were taken from under old cactus. Great numbers of dead forms ~~were~~ lie ~~in~~ around. This species nearly ~~contains~~ reaches the upper limits of the green zone - being a characteristic semi-green zone species.

Accompanying P. jacobi, was a species of Pupa - unrecorded for this island. The form is longer than "clausa" & has a sharp apex. - Very like the few specimens taken at Villa viel. in the green zone. This shell continues into the fern zone. some were taken at

about 1750' alt.

"Succinea Bettii" was first taken at about 1500' alt. It's true station is on the bushes - being commonly hidden under the moss of the Castella. This form probably ~~ambiences~~ some distance into the upper wood - or "brow" zone as I shall call it, but it is primarily a

A number of dead specimens of a species of Succinea, probably "S. conica" were taken in the middle green zone - at its upper limit being ~~co-existant~~ with "S. Bettii". Probably a new record for the island.

A number of minute dead forms probably "Succinea Bauri", "Cneulus galapagensis", & "Vitrea ~~plat~~leamensis" were observed in the brow zone. True station is at the base of grass tufts.

Swallows & Bellen naturally found all their ~~of~~ specimens assembled at 1700' alt. that being the highest point on the Cape Chalmers ridge, their field of exploration.

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W33

B. jacobi. 1700'
Suppya Bauri. 1700' dead.
Cmulus galapaganus 1700' numerous.
Vitrea chathamensis 1700'
Pupa plausa. near sa buel
Succinea Rettii variety Wolfi at 1700'

Photographs

1. Jervis - general view from James.
2. Chatham. 2 views of Pt. & rocks vegetation.
3. " distant view of Pinger Rocks.
4. Tagus Cove. valley back of spring and side of great crater.
5. Banks's Bay. distant view of crater
6. Charles. 3 phots of B. on bushes
" 1 of B. under stones.
" 1 of S. on bushes.
" 1 vegetation 1100 ft. alt.
" 2 views of country & the N. of "Fork-and-Point" - big crater included
7. Wood. - Mr. Beck. Stone with 3 species of B. Up 350 ft. alt.
8. Distant view of Barrington.
9. Land-shells of Barrington under stones showing environment characters.
10. General surface of island.
11. James. - phots of large congybel B. on bushes.
12. James. phots of smaller B. on bushes.
13. James. - general vegetation view.
14. Villa Mil. - phots at 3200' alt. - of B. on lava & ash.
15. Villa Mil. - 600' alt. B. on Castella -

356 16. - Generale view of green zone
at 600' alt. (villa nuove)

Occasional Ideas

Wallace, "Island Life"

p. 271. Reference to Juan Fernandez. Speaking of the peculiar land-shell species etc. the fact is cited that they indicate a remote introduction. Thus that in past time the conditions for introduction were much more favorable.

pps. 267–268. Speaking of the derivation of the Galapagos birds. The same point of remoteness of introduction is cited for the peculiar species according as they differ more or more from Am. genera of species. Thus that conditions in the past were more favorable for bird or life introduction. Mentions that there may have been intervening islands & also as stepping stones.

Possibility here of introducing the idea of a former union of the whole group to form one large island. This would increase the chances of accidental introduction.

The necessary rise in elevation

to bring about this union might possibly bring above the surface of the ocean any undiscovered areas of subsidence.

Wallace p. 256.
Material on the land-Shells of Bermuda illustrating the ~~relations~~ ~~and~~ relation number of peculiar shells. ~~related~~ to the remoteness of introduction. — and peculiar species arising from unfavorable possibilities of introduction.

Wallace p. 243
Same considerations as above for the Azores.

In these references ~~it~~ is discovered the origin of Dall's idea of the relation of the Island number the mainland — those further away — He assumes that the nearer islands are the most abundantly furnished with peculiar forms.

Occasional Ideas

Wallace "Island Life"
p. 66 — 78
Important ideas on land
Shell faunas & their spread

North Am. Fauna. No. 3.
U. S. Dept. of Agriculture
Survey of San Francisco Bay.
Plates Nos. I & II. Excellent ideas
* be used in my own work on
mapping life zones.

Good & important information
for securing the adult shell & original
ribbon for examination of number
& arrangement of teeth.

Tryon Vol. I pps. 96 — 97.
Formula given.

Tryon Vol. I pp. 198 etc.
Important information in land
province which should be studied to
determine the nearest relative & the
Galap. fauna.

Vol. I pps. 178, etc. ~~on important~~

distroduction to substance of Land Regions has important generalizations on the relation of tropical diversity & poss compared with the arctic similarity - that the pauras of tropical, isolated, islands seem the remnants of great stocks swallowed up by the sea. - thus an important idea relative to autochthonous in explaining certain difficulties.

Tryon. Vol. I. pps. 206 & seq.
Some good reference notes on the Hypometrical, (alt.) Distribution of Land & Fresh Water Shells.
Of value in discussing Environmental Distribution & Laws of the Land Development.

P. 74. Wallace "Island Life"
Reference is made to the great antiquity of Land Shells. Zittel pps. 495-499
Has material on this point.
Also the table p. 501 (Zittel)

Land Shell Catalogue

Pkg. No.		No. Specimens
Bottle 5	B. hoodensis: B. approximatus: B. Snodgrassi(?)	75.
" 6	" " "	580.
" 7	" "	180.
	Penn Gardner - may be designated as a sub-genus or an intermediary form between B. hoodensis & B. Snodgrassi.	~~+80~~
" 7+	Same as above. Preserved dry.	30.
" 5 S.	A form taken among marine shells at high tide mark. In appearance it is much like the semi-aquatic form (large) taken from the old log near the mouth of the creek at Cocos Island.	1.
" 8.	Shells taken from Gardner Island; near Charles, in the situs described in the notes.	115
" 9.	Champion Island living specimens.	20
Pkg. 10	Champion Island dead dead specimens - recently dead. Taken for their color variation.	40
	One large dead dead shell of another species	

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Pkg. No.		No. Specimens
Bottle 12.	Specimens secured some 2 miles S. from Post Office Bay. At an altitude of 280 ft. Under stones. Scant vegetation. North side of volcanic cone 675 ft. high.	12
" 12.	Taken just south of the flamingo lagoon near Cormorant Bay. Altitude of 75-40 ft. Scant vegetation. North side of high volcanic cone. Under stones.	20.
" 13.	Five specimens taken from the region S. of the E. end of the flamingo lagoon. At a height of 75 ft. under loose lava blocks glued to the rocks. Surrounding were great piles of recent lava & small sharp pebbles of broken down lava. N side of the lava cliffs - no vegetation except a few scattering pieces of the white drygooping mint scented bush. Probably two species.	40.
Pkg. 14.	Dead specimens taken from the same region & occurring in the same station with the living forms.	35

Land Shell Catalogue (Con.)

Package Number		Number of Specmens.
Can. No. 15		1100
	Specimens taken from under old logs, at the base of bushes, & on the stems of low bushes. alt. 550-1000 Dominant endemic.	
Bottle. 16.		75
	Obtained from the under side of ~~lava~~ loose lava blocks; glued dominant. Alt. 50 – 300.	
" 17.		35
	Succinea on the leaves & stems of small bushes. Dominant. alt. 1000.	
" 18		20
	Taken from the under side of ~~old~~ rotten logs. together with the ~~of~~ those in can No. 15. but selected because of their particular shape & species forms. Dominant alt. 550-1060.	
" 19		25
	Succinea Occurring along with those of can No. 15. – on the under side of ~~old~~ loose lava blocks	

364

Bottle No. 20. 125

Succisa with a few accompanying B. fonns. on the leaves & stems of small bushes. Alt. 1200-1500 ft. Region of mists. Grass & small bushes. ~~Alt~~ Only semidominant.

Can. No. 21.

Bottom half of can contains the 1200 common B. fonns such as (Can No. 15) Alt. 600-1100 ft. Lower limit of mists.

Upper half of can contains the newer (Oct. 7) B. fonn. Alt. 1200-1780 ft. Beginning in a fairly abundant growth of vegetation this fonn extends into the grassy zone of this island; beginning at about 1650-1700 ft. This fonn with its accompanying var. stoloniB. fonns is the one which becomes the more abundant ~~As~~ the higher it was taken. (as described in the notes). Under 5 stones.

Bottle No. 22 10

A few fonns taken of the No 21. smooth B. style specimens taken merely as a type & for ease of reference.

Land Shell Catalogue.

Bottle No. 23 — 30

Succinia. on bones. alt. 1700 ft. the extreme upper limit of the vegetation of this island; in other words the lower margin of the grassy zone. Region of mists, breezes, & fairly cool temperature.

" " 24. — Succinia — ~~50~~

Taken at ~~as~~ foot mt. S. of the high point. alt. 1000 — ~~1200~~ 1650 — 100

~~Cochlicopa~~ Succinia. On the stems & leaves of small bushes. Fairly abundant vegetation. Quite a deal of moisture. Region of fog condensation. Very active state.

" 25 — 50

Bulimulus. Same situs as No. 24. - Alt. 1000 - 1200 ft. Accompanying Succinia. Seeming to disappear after 1200. to reappear at 1650 in abundance.

" 26 — 350

B. Alt. 1650. Under moss, & the stems of small tufts of grass - and on

stems & leaves. Grassy surroundings. Cool breezes & some moisture. Quite a ppt. ~~moisture~~ moisture during the time of collecting. *Interesting thing in variation as noted in the notes.

Nos. 25 & 26 are probably diff. species from those two for taken.

Pkg. 27. - - -

Land Shell Catalogue

Bottle No. 32. 150

Chatham Island.
Taken from under lava blocks near the sea shore: alt 25-60 ft. Dry surroundings. Characteristic first gone.

" No. 33 Wrecks Bay. Complete condition of hibernation: fast to under side of stones 380

Barrington Island.
Under lava blocks. Alt. 200-400 ft.
Dry and surroundings. Not complete hibernation. N.E. end of island.

" No. 34

Under lava blocks and dry twigs near under the blocks. Alt. 200-400 320
Situs same as No. 33. N.E. end of island.

" No. 32 Supplement Chatham Island 25
Same as No. 32

" No. 35 Indefatigable Island. 200
Auricula.
Taken from the salt lagoon at S.E. anchorage

" No. 36. 650
Under lava blocks. Alt. 200-~~450~~ ft. 70
Dry surroundings. Hibernation ..

368

Bottle No. 37 — Minute Jonas taken from under lava blocks. Alt. 650 ft. Fairly abundant vegetation + ferns orchids etc. Hibernation. — 40

" No. 38 — Leptinaria like Jonas. Under lava blocks. Alt. ~~650 ft~~. 400 - 650 ft. Hibernation. — 15

" No. 39 — Albemarle Island. Turtle Cove. Auriculae like Jonas from the first salt lagoon going inland. — 100

" No. 40 — Salt lagoon some eight miles west of Turtle Cove. — 200

" No. 41 — Salt lagoon - 2nd. inland. near first Jonas. — 125

Indefatigable Island. South Side

" No. 42 — Succinia. On leaves of Nolana Glory etc. Damp. surroundings, plenty vegetation. Regions almost constant rainfall. Alt. 450 - 650 ft. — 25

No. 43 — B. Jonas. Take alive. on tree trunks. Alt. 450 - ~~650~~ 550 ft. Damp surroundings, rather abundant vegetation. — 100

44 — B. Jonas. On ground. Damp surroundings. rather abundant vegetation. Alt. 350 - 500 — 25

Land Shell Catalogue

Bottle No. 45 — Indefatigable Island — South Side — 10

Alive on leaves. Damp surroundings. rich vegetation. Alt. 500 - 650 ft.

" " 46 (Cotton Mouth) — 5

Dead specimens. S. side. 750 ft. alt. damp surroundings, rich vegetation

" " 33+ Barrington Island - Same as No. 33 — 40

Cartridge Box — A few dead Auriculae from the salt lagoons directly inland from Academy Bay. Indefat. Island. — 6

Bottle No. 47 — Duncan Island — 3.

Alt. 1275. Under lava blocks. Rather ~~grey~~ green surroundings; lichens, ferns, orchids. (Dead)

" " 48 — 2.

Alt. 1275. Under lava blocks. Same station as above.

" " 49 ~~Alt. 1275.~~ — 15

Alt. 1275. Same station as above. At the roots of the grass next the lava blocks.

" 50 — Indefatigable North anchorage, inland 5 miles. — 3.

alt. 1000. Under lava blocks. Very dry surroundings. (Dead)

370

No.51 Daphne Island. 5

358

Alt. 250 ft. Rocks & crater. Under lava blocks. Completely dry station.

No.52 Jervis Island 200

Alt. 900 – 1000 ft. Under lava blocks. Last 100 ft. of highest point on the island. Rather dry surroundings now (dry season), some mosses, ferns & small bushes. State of hibernation.

No.53 James Island 50

Alt. 1000 - 1800 ft. Under lava blocks. Tall trees and thick bush growth of this alt. on the S.W. quarter. Hibernation.

No.54 Same station as No. 53. & accompanying them. 60

No.55 Same station as those of No. 53 & 54 35

No.56 Alt. 1800 – 2750. Most of them at 1800. On bushes of Scalesia. Tall trees, bushes & green surroundings. Hibernation. 25

No.57 Alt. 2100 – 2750 200

On grass & bushes. Active life. Described in notes.

Land Shell Catalogue

Indefatigable

No.58. about 6 species taken during the 225
inland trip of Jan. 15-18 as described
in the notes - in all altitudes from
350 - 1100 ft. - in stations described
in the notes.
"

No.59. Chatham 150
Under stones. B. L. & 2 S.
First zone. alt 0-300 ft.
Fairly green in rainy season

No.60. Hood. 400
Under lava blocks. Stale of
hibernation. Extremely dry, dusty
environment - thus far!
Lower bench from S.E. 500 ft. elevation, upper
plg. from N. Boc ft. elevation.

No.61. Gardner
Under lava blocks. Hibernation. 90
Very dry surroundings. alt. 150 ft.

No.62 Chatham
Under barks of recent dead trees. Fairly ~~618~~.
abundant growth. - plenty of very grass ete. 620
Creek gold crater. Finger Rock. N. Saddle
Coxe

372
No. 63

Chatham

North Middle Slevin

350

Under stones. Kilpatrick. Characters of the first zone. Partly under the influence of S.E. winds & moisture. During the time pulleteni Feb. 12, 1906. There were passing showers & the whole scenes was green. Succinias were taken from under the stones with the rest. Altitude probably 450-550-600 ft.

No. 64 — 225

Chatham

Under moss & at the roots of grass tufts from the grassy, open, moist zone of the highest altitudes. 1900-2500 ft. Set. Succinea, Pupa, Helix, & 2 Bulimulus.

No. 65 — 5

Charles

S.E. territory. Alt. 750 ft. Under fungi & the lemon grove.

No. 66 — 150

Albemarle.

Taken along the trail from road to rim & crater. Those in cloth 500-700 ft. -wooded zone. Others: 2000 ft. - 3100 ft. grassy zone. on leaves.

No. 67. — 580

Taken from mangrove swamp one 12 miles west of Villa Nuels. Snails walked in swamp

68 — 10

Dead specimens taken from under stones near road at mangrove swamp 12 miles west of Villa Nuels.

Land Shell Catalogue.

No. 69 — Albemarle — Iguana Cove. — 110

Specimens taken on mt. mountain 200-250 ft. alt. under dead leaves on damp ground. Possibly 6 species. B. S. Pupa. & 3 varieties of Helix or Bulimus. Typical green zone surroundings.

No. 70. — Albemarle. — Iguana Cove. — 150

Specimens taken on mt. back of cove. 600-700 ft. alt. On dead leaves & short green plants. Same species & surroundings as the foregoing

No. 71. — Albemarle Iguana Cove. — 50

Taken on mt. back of cove. at 15-60 ft. alt. Under Stones. Where slope is very steep & vegetation sparse, consisting mainly of trailing vines.

No. 72. — Albemarle. Tagus Cove. — ~~220~~ 250

Alt. 4000 ft. Rim of crater. Thick belt of brush. Under leaves. & stems of grass tufts — 550

Specimens in cheese cloth were taken at 1500 ft. alt. under bones & bark of dead cacti.

No. 73 Same elevation, same situs & notes as No. 72. 75

No. 74 Pupa. Specimens taken under bones at 200-250 ft. alt. Thin vegetable, first gone. Notes. 5

No. 75. Bulimulus. Tagus Cove. 60
Under stones. First gone. Some grass & annuals. Alt. 1600 ft.

76. Pupa, Succinea. etc. 60
Same as No. 75. Under cactus bones on ground etc. 1600 ft.

77 Narborough. — Mr Beck #150
Specimens from Narborough - taken from 2000 ft. up & summit-on rim. First & then from cactus. on grass etc. This ~~at~~ situs will do. Ought & pine vitrinoting & valuable. Practically all from the green zone.

78 Albemarle Tagus Cove. 100
Pupa & Bulimulus. Specimens taken on 250-300 ft. elevation. dry thin veg. 1st. zone described in notes. Found hibernating in rotten wood.

Land Shell Catalogue.

No. of Pkg.		No. of specimens
79	Albemarle Banks Bay Mt. back of bay. Alt. 1500-2300 ft. On leaves. Typhead green zone	250
80	Mt. back of bay. Alt. 325-400 ft. Under stones. Hibernation. Thin vegetation. Dry. First zone. Pupa. Succinea. Bridgmani	50
81.	Narboro N. Coast. Pupa. Taken from under stones. dead leaves etc. Alt. 50 ft. Dry. barren surroundings. Some actinia.	50
82.	Charles. Trail. Black B. B. & S. Hibernation Under stones. On bushes. & tall weeds. 800-1100 ft. Alt.	1200
83	Same as above.	1200
84	" " "	1200
85	" " "	350
		4300

86 S. Lemon grove. On leaves & stems of trees. Same nest hibernating. Alt. 800 ft. — 50

87 ———————————————— 6

B. Under stones & occasionally on bushes. 1000 ft.

88 --- Under stones. Near spring. ———————— 70

89 -- Under Rotten wood. Lemon grove. 500 ft. alt. -- 150

90. -- On Bushes 500-900 alt. (Crotus). ——— 200

91 - Leptinaria, Under stones, in damp spots- at the lower spring. Spring mt. alt. 1000 ft. (Spring mt --- 1650 ft. alt.) 100

92 --- Bulimulus ———————— 50

Specimens all taken from the two lowest zones. 000 - 500 ft. Under stones and rotten logs. Hibernating. Exceedingly dry at this season., May. 25 1906. In size & surface sculpture, coloring they are typical dry zone forms.

93 --- Bulimulus + Succinea ———————— 1500

In bottom of jar are from top of 1650 ft. (Spring) mt. Under the fine rotten stones & at the bases of small bushes, such as Heliotrope & Croton. Quite damp. cloud & fog swept environment. Intended to show color variation between this & the specimens of lower altitudes - as noticed first & mentioned in the notes of the Oct. visit.

93+ In cheese-cloth sac. From Lemon grove at base of N. sides of 1650 ft. crater. Taken from (Succinea) leaves of bananas. B, from stalks of small bushes.

Land Shell Catalogue

No. of Pkg.		No. of Specimens.
~~94~~		
94	---- Charles ------ Bulimulus. ----------	2500

Small pale, B. were taken from the stems of small bushes growing along an old water course & the S.W. Spur Mt. at 750 ft. alt. Hibernation. Taken & show altitudinal variation with regard to the same species taken from top of 1650 ft. crater.

Large, brown, smooth forms were taken from rotten wood in burnt grove on the S.E. slopes & direction from 1650 ft. crater. at alt of 750 - 1200. Species pertinier to top of 1650 ft. elevation & has been pitted from 1780. ft. crater - in Oct. Notes. (Two old dead shells.)

95	---- Bulimulus ----------	350
		2850

Specimens of a very abundant species along the trail at 500 - 600 ft. alt. on low bushes of "Coprosma dulcis" mostly. Hibernation. Taken for small & altitudinal variation. 500 - about the lower limit of these & the similar, higher species.

96 ---- Bulimulus ---------- 350
50 g- 600 Same as No. 95. In Formalin.

97 ---- Bulimulus ---------- 400
950-1000 ft. alt. Common species. Selected for brilliancy of color & perfect, representing the maximum of development of these particular species & general type.

98 ---- Bulimulus ---------- 50
Taken from under old logs at 750 alt. They accompanied the species of No. 96 & 97. Probably the first of the species which becomes so common above 1500 ft. in the neighboring mts. Open, dry surroundings - abundant bushes of Cistus & Cneorida & Lipochaeta.

99 ---- Bulimulus (3) Succinea ---------- 1500
East side of 1750 ft. mts. on Lipochaeta & in the grassy (brown part) under stones. Succinea ~~found~~ only at 1700-1750 ft. under moist rocks & bushes.
General pkg. 1500 - Top.

100 ---- Bulimulus ---------- 150
300 ft. alt. Maximum height of the dry zone type. Under rotting logs. Numerous. Open surroundings. Small bushes same as No. 98. Just above the cactus & properly in the 2nd. zone. Hibernated. Very dry. Sandy under soil. (Formalin.)

Land Shell Catalogue

No. of Pkg. | Number of Specimens

Charles - Con.

101 ---------- B. ---------- 900

300 ft. alt. Increased series of No. 100. Same station. date etc.

102 ---------- B. ---------- 700

300 ft. Same as Nos. 100 & 101.

103. ---------- Pupa ---------- 50

750 ft. alt. Taken from under dead brush & old bones. Same conditions of station as No. 98.

104 ---------- Vertigo(?). ---------- 50

1700-1750 ft. alt. T/p of 1750 ft. crater. Burn zone. Under rocks clinging to bushes & under mosses on low rocks. - Especially the few bushes of Heliotropium

June 5, 6, & 7 1920.

~~150~~ 1100

105 ---------- Bulimulus ---------- 150

Taken from under lava stones at the summit of 3800 ft. elevation. Actual state. (Formosa)

380

106 ---- Pupa ---- Hood ---- 10

Specimens of Pupa taken by Mr. Hood from old tortoise burrow at about 350 ft. alt. Dry, usual. Per surrounding a. characteristic of Hood.

---- Pupa ---- Hood
in paper package. kept for life-
history. 25

---- Barrington ---- Bulimulus ---- 10

Specimens in paper package
kept for dissection
usual condition 2 species.

107 ---- Barrington - B. ---- 50

Specimens of the two species of B.
common to Barrington. Taken from
under logs about 250 - 500 ft. alt.
in January.

108 ---- Chatham ---- 25

Taken from under stones & bottom of
grass tufts in the drier green, tufted
ground to E. & S.E. of Hacienda. Most
ground frequented by Hogs.
500 - 700 ft. alt.
~~700 - 900~~ ft. alt.
Field Census. No. 8 B. Journal
per tufts at 1500 ft. alt. about.

109 ---- Chatham ---- 10

Grass near Tank. about 1800
- 1900 ft alt.

Land-Shell List.

110 ----- Chatham ---- Pupa ------- 40

Under stones in arid country at & only slightly above the sea-level. These specimens are particularly subject & the light dust of the lime-stone both in form of dust & impacted crust.

110 -------- Chatham ---------- 40

Taken from under stones. Alt. ranging from sea-level to 350 ft. about entirely in the arid dry belt / island.

111 ------ James ---------- 10

Dead specimens taken from under stones at 750 ft. bald. Arid. barren surroundings. Country back & north of Sullivan Bay.

112 --- B. 2 species. Pupa, Helicidae etc. 30

Large corrugated specimens of B. taken from bushes. - large one from amphitaea - smaller taken from vine. 2200 ft. alt. Pine vegetation. Pupa & other small forms mere

382

taken from under dead leaves & at the base of grass tufts. 1800 ft. alt. - merging into the deeper green of high levels.

113 ---- B. - 2 species ---------- 10.

Dead specimens taken from under leaves etc. & scattered about the ground from 200 ft. to 1200 ft. alt. ~~They were~~

114 ----- Albemarle, Cowley Mt. ---------- 50

Pupa, Bulimulus, Vertigo, Helix etc.

Specimens taken from near the top of Cowley Mt. Albemarle island. Found under dead wood lieing on the ground alt. 2100 - 2300 ft. Fairly abundant vegetation: Common bushes & tall heavy growth of grass. Dry season. Hibernation.

---------- Duncan ---------- 1

415 Single live specimen of B. probably B. "duncanensis". Found under stones at 600 ft. alt.

----- Albemarle, ---- Villa Mil. ---------- 200

116 B.; P.; V.; S.; H.; all taken from under dead leaves at the bases of the bushes - slightly above the hacienda 'Jo Helen'. Range ~~1800~~ ~~450~~ 500' - 1300'

Bulimulus has a possible range of 900' - 1400'

Few B. on bushes.

Land Shell List.

117 ---- Albemarle -- Villa Mil. ---------- 150

B. taken from the bushes of Helicteres & Castilla. 480' — 700' alt. - green zone proper. The above zone of collecting marks the range of this species 480' alt. about the beginning of cactus. 700' - meaning the upper margin of dense green. Hibernating

118 ----- Villa Mil. ---------- 1000

B. taken from the bushes of Helicteres & the leaves of grass at 2800' — 3300' Alt. - The rim of the great crater. They were found running at the rim. Probable range is represented by 2800' — 3300' Alt. Hibernating.

119 ---- Villa Mil - ---------- 1.

B. taken from under dead wood just above the hacienda, at 1,300' alt.
Only the one specimen obtained.

384 ---- Tower Island ----- ~~25~~

120 a few live specimens of Pupa. Taken 10
from under deadwood & rolled-leaf bunches
of leaves.
Probably never taken here before.

121 ---- Bindloe ---------- 10
Pupa. Taken from under dead
wood in the dry Pupa area near the
road on the W. side.

122 ------ Abingdon ---------- 25
About 6 species of the common
shells of this island.
Taken from the stations & heights
given in the notes.

July, 26 — Seymour.

Trochus

E) Monodonta. (Oxyplele) patula Zittel p. ~~46~~ 451
Tryon Vol. II p. 313.

A) Turbo - appearing fig. 8 & 9 Zittel p. ~~448~~
Tryon Vol. II p. 304-305

Natica. - similar to Zittel p. 462
Tryon Vol. II p. 204-6 plts. 63 & 64.

~~I~~ *) Turritella hoffmanni.

V) Bulla

Marine Shell Faunas.

1905

Hood Island

Sep. 25. Collect in Gardner Bay during low tide. Very poor collecting - only secure a number of specimens of Purpura. the same species as the Crocker Island forms. On the coral ~~sh~~ sand beach, I noticed a number of ~~dead~~ old specimens - mostly three or four Cassues & Cypraes & ~~one~~ a few other small pretty shells which I did not recognize.

Sep. 27. Work on the lee ~~(north~~ (north) side of Gardner Island. Have fine collecting & take a nice series of about 4 species of Purpura. The large shell which looks like P. platulata. was especially fine. Secure a number of the larger Chitons which are quite abundant. Walking along the south shore I secured a number of beach specimens which I shall keep as diagnostic ~~sh~~ forms of this region.

Sep. 28.

Spend all A. M. in making a complete coastal survey of Gardner Island. The specimens taken are the same as those of yesterday - but much less in number. The lack in number of shells collected is ~~due to~~ probably due to a certain characteristic of the ~~fauna~~ habitat: - the ~~most~~ favorite home is the larger, smooth, water-worn, boulders; where the lava persists in a rough, jagged outcrop only a few shells ~~were~~ are found. Thus the available territory for ~~gathering~~ collecting was much abbreviated by the fact that the whole eastern & north-eastern part of the island is such a rough lava region. ~~On the~~

On the wide southern frontage of the island is a series of coral sand beaches. Like Gardener Bay on Hood. The shell life is rather scanty. On the high tide limit of the coral beaches I secured some fine dead specimens of the deep sea forms. The best of these are taken to appear in the diagnostic collection of this region.

Sep. 29.

Gather a few additional beach specimens - some especially fine Cypraea etc. Secured one large shell which looks much like a Voluta. It will do as a scientific specimen for the animal was still decaying. ~~It was~~

Sep. 30

Rocks on the north side of ~~Isabella~~ Hood, just around the promontory from the anchorage. This is in the lee of the island from the usual current & S.E. wind. The rock is a smooth lava which makes collecting good. Secured a fine bunch shells & many Crinoids etc. & several of the forms are now the first taken alive of the many numerous beach specimens ~~taken~~ gathered. The life in this protected cove seems especially abundant & may serve as a key to future collecting.

Temperature Note.

Dana p. 47. — Notice & thought placed on Dana's map & argument re temperature distribution it is important as an explanation of the ~~the~~ cause in the similarity of the shell fauna of these islands to those of far northern latitudes.

The map is excellent & should surely be taken for

reference in paper building.
Read the complete argument in this chapter.

Oct. 3.
Landed on Saunder's Champion Islands near Charles. Noticed a few marine shells. but they were Pupuros such as taken on Hood.

Oct. 4.
Do just a little collecting in Post Office Bay. No ~~cliffs~~ Zonas Jones Hood taken. Shells are in better condition however - absence - due to a lack of the red deposit from red volcanic lava.

Oct. 5.
Do considerable collecting in P. O. Bay. Secure a nice bunch of shells. - especially a good series of Ceithium: a few Conus: all in fine condition.
~~Have~~ Take two new forms, only as hermit-crab specimens. but taken for what they show.
Notice that where the sand drifts into a rocky region. the shell life is scarce - almost nothing except the hermit crab ~~specimen~~ shells.
No plutons observed or collected.

Oct. 17 Chatham Island.
Observe the rocks in Wrecks Bay to be almost destitute of shell life. but the sand banks are entirely shell remains.

391

Hood Island.

379

Feb. 1 – 7 - 1906

Do some marine beach specimen collecting. The special note is the condition of the lately dried Asteroidea – it is noticed that along the lower border of the shell is a yellowish pink of a leopard spotted enamel which seems to have been present over the dorsal surface & expose the bluish or purplish striped area. Now one shell was taken showing the beginning of this breaks up of the spotted enamel & the question arises – is this a pre-mature stage or are the beach specimens entirely worn.

Collected in bay to N.W. from anchorage – distance to small point all taken from under stones. Fissurella & a blades – region of coral & shell sand drift.

Temperature Note

Feb. 9, 1906.

When we arrived at Hood Sep. 24, 1905 the ocean temperature was 68° F. It remained at this point during the visit. As time passed & we proceeded northward the temperature slowly increased until 77° F. seemed the maximum. For some time past the ~~food~~ temperature has remained about this height, - no higher, sometimes 75° & 76.°

During the Feb. 1-7. 1906 visit to Hood, the ocean temperature was taken approximately at 77° F. ~~the~~ I made no account for this warming up effect.

Talks with Cap. Parker. during this time the westerly winds have piled up the warm waters in the bay of Panama. forcing the water in a restricted outlet to the Gulf, bight at the S. border of the bay. After passing this ~~island~~ extensive bight the warm current encounters the cold ant-ar

Temperature Note. (Con.)

arctic current. The contact of the two gives them a general mixing direction causing them to impinge on the Galapagos Group. The Gulf of P. is shallow & in the summer the vertical mov. of the waters of this region are the more easily heated. Again it is reflected that the heat equator for this region is about 18° N.

It has been observed that during the past four weeks the daily temperature has been increasing very perceptibly. During the daylight hours the sun has seemed to burn with special violence. This may be due to the present nearly vertical position of the sun & the prevalence of the trade winds (S. E trade).

The air & ocean temperature remain fairly constant at about the same temperature. At Hood when the waters was 68° F the air was 68° & 70° F. later in the trip when the waters is taken at 76° & 77°, the

air at the same time & place was 76°F.
~~&~~ 77° & 78° F. Temperatures were taken in the morning about sunrise. Ocean water ~~samples~~ temperatures were taken from bucket falls. poured from over the side. This is surface water, but in most cases the water is kept in a constant state of movement ~~so as to~~ by the varying speed of the currents & the rough configuration of the coast & sea-bottom, so that there is hardly a surface warm layer

1. Remember Davis temperature words. ~~Reflect on the possibility of the~~
2. Reflect on the possibility that the minimum temperature controls the marine shell life.
3. Investigate Trypus life Zone map in front of Manual

Barrington Island

Oct. 21 - 1905

Anchorage at N. E. end of island in quite close to an almost enclosed shallow bay. This territory looked good for collecting so a small travel was made. Nearly two hours was demonstrated but the travel worked fairly well, but the bay is almost destitute of shell life - due perhaps to its shallow depth & quite an abundance of slowly shifting sand.

At low tide the shores of the bay were visited. Scarce in marine shell life.

A few Pupura were taken, they were the common species taken at Hood etc.

Second one live specimen of the large Turbo which was so plenty & full as hermit crab specimens on the beach at Croc.

Two or three beach worn specimens of Murex were taken from the beach of the bay. Taken merely to add to the diagnostic list.

Indefatigable Island

Oct. 27, 1905

Marine life in the S. E. anchorage is rather scarce, due to the sandy bottom & the direction of the prevalent winds which sweep the otherwise good collecting rocks with sand. A notable example of the working of this observation is a deep bay on the W. of the ~~bay~~ larger bay indentation used as an anchorage. In this smaller bay the shells were quite numerous. It was interesting to notice the increase in number as passing along the N. shore we slowly came within the shelter of the projecting headland. The specimens collected were taken here.

Nov. 7. 1905.

Academy Bay offers the finest territory for marine shell collecting. It is well protected by headlands which extend to the eastward, thus guarding the cove from the prevailing winds and sand drift. The lava flows

extend outward & are so placed that numerous deep lagoons & tide water pools are formed thus offering excellent abiding places for marine life. Of the marine shell collecting the notable acquisitions are a giant oyster, mud oyster, & two of the large, beautiful cypraeae.

Nov. 16 - 1905.

Worked in the fine lagoon like tide pools. A number of new acquisitions - Murex, Turbo, & Ceithium. Nos. 14. worked in the lava blocks just off the hunt. Found the large Cypraea by digging & prying away the blocks where the shells are imbedded, within salt water always. (Dissected) localities are as favorable - the list of species is steadily increasing. Most of the shells have an unusually deep fine like crust. It yields to acid with a slight effervescence.

Nov. 20-'05 Secured some fine Cypraea & the small parish bird at N.E. anchorage Duck pathyrhynchus. Two new beach specimens.

Nov. 21-'05. Seymore. Secured a few good beach specimens. among them one new form not yet taken.

Indefatigable Island

Nov. 24. 1905

At anchor in a fine cove on N. side of island. about midway between Seymore & Albany Bay.

Just to the E. of this anchorage some 1½ miles is an excellent lagoon. It is formed by the peculiar points ~~of lavage~~ formed by the lava in it's flowage toward the ocean.

Fig. 1.

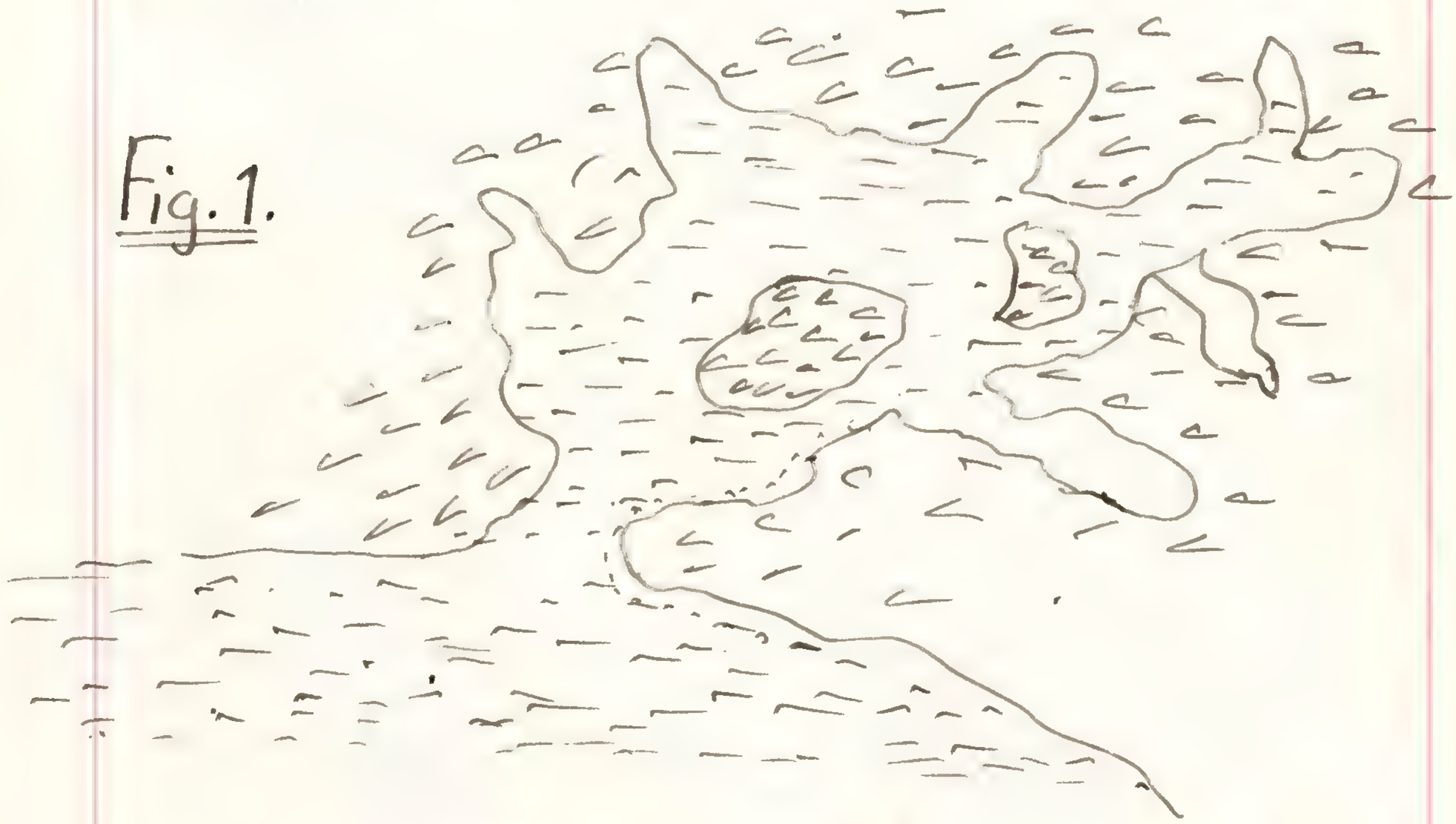


Fig. 1. illustrates the general arrangement of the lava flows which has made the lagoon possible. At low tide the narrow entrance is hardly passable in a small boat, being shallow & protected by a barrier reef of lava. This shallow entrance

pennsa, makes the waters of the lagoon exceedingly quiet, thus affording an excellent resort for marine life. The bottom is quite rocky but has lost its harsh low character due to the soft mud which fills the greater part of the interstices. The borders of the lagoon are densely grown with mangroves, which give a pleasant shadow from the direct rays of the sun. Among these borders and well among the mangroves themselves, at a depth of 2-6 ft. occurred an abundant shell life. Of course they were such forms as proper a rocky bottom; the Murex, Cerithium & Ostrea. It is remarkable that besides their station on the bottom the greater part of the specimens taken were found adhering to the mangrove stems both above & below the low water tide level. It was especially novel to see the numerous oysters in this position.

Scattered over the bottom of the lagoon were numerous star fish, sea urchins, & different species of anemones.

Indefatigable.

July, 16-17,-1906

Visited much of the collecting ground in the adjacent fine area of Academy Bay. The same observation as that at Hood was made- a absence of a great number of the numerous species taken here on former visits. A few chitons, Purpura & Murex, Crithium, & Bittium were observed in their old stations. As stated before, this is the cold season. The winter of the Southern Hemisphere :- the cloudy weather - setting in of the trade - winds and the sun's farthest north all work together & make the lowest temperature in the ocean waters.

The mollusks of the Californian coast are observed to go through the same change of station with winter. (Hibernate? Shelter- this be a time for breeding etc)

July, 21-'06

Collect marine shells in the sand washed bay just S. of

Conway Bay. The rocks are smooth, large, & generally quite spherical. The interstices are filled with loose sand. The beach is generally open to a heavy surf & the sited characters of the bay make it an unfavourable place for marine shells. The only stations attainable by the mollusks are the high & subtidal rocks at low tide — naturally only those shells which occupy the new upper limit of the littoral zone could be found. The species collected were:-

3 species of Purpura

1s. Crithium

2s. Conus.

Numerous sea slugs

2s. Chiton

Observed two large Purpura just finishing the eating of a pair legged Chiton. The two molluscs secured & bore killed. The Chiton in common ~~& Thais~~. Both shells still held on & Hermit. Made of the Two & pair of fallen ~~Thais~~ mollusc.

A large specimen of the known & loved Purpura floridana St. Kitts fish

Cuclostabgabe.

was taken. boring with its central
depression on adult specimen of
"Cypraea pantilla" (?) (small mouth) of
sucking the mollusks from its
shell there. by the use of its
numerous powerful suckers.
Thus mollusks prey
& are preyed upon.

Should note here, that at
Nearing Bay a specimen of
Murex was taken boring what
recently enclosed an oyster
within the shell grasp.

Probably one of the reasons
why Muricidae are so numerous
at "Murex Cove". N. Cudefa D.
Pacific Palms

July. 23.
Dredged along on grass N. of cove.
Nothing particular except the
taking of one live "Cypraea
exanthema"

July. 26,
Dredged in "Murex Lagoon"

during the low-tide period. The winter season here is well marked by the great scarcity of marine life. Chitons were few:- Only about ½ doz. Mytex were seen:- ~~the~~ Pinnaea were taken.- but the Melampus in their tide-water lagoon were as abundant as ever.

James

important idea

It appears from the marine shell thus far taken that many species occur here which ~~have~~ intergrade between W. Atlantic species - at least a great many pair a series may prove this in some cases. It is to be noted especially in the large bivalves Cypraea. etc.

The similarity is confined principally to the West Indian fauna.

Nov. 27 - 30, 1905

Continued collecting in the lagoon Sig. I. Acquired some valuable forms not yet taken, one being 3 specimens of the monster Pinna. The little crab boiled in Trym was found when the shell was cleaned. These specimens were taken from the mud along the mangrove borders of the lagoon. Another acquisition was some half dry large bivalves, oyster like, which were adhering so firmly to the rocks

that they could only be obtained after heavy pounding. Their station was an exposed lava flow, rather covered with mud & just above the extreme low water marks.

~~Dr.~~ Mr. Beck discovered rather an extensive extension of the lagoon & the westward. Its waters are almost completely cut off from the main lagoon, & thus it lacks the tide flow, is quite & forms quite a typical salt lagoon. From the mud, under the bows of sticking to the Roots of the mangroves I secured great numbers of a pulmonate, probably some species of Melampus. They show great variation & may be useful in species building.

It now occurs to me that the stupified dead forms taken from the lagoon at Academy Bay is another species of Melampus

Duncan Island

Dec. 3-18, 1905

This island rises abruptly from the ocean on all sides, except in a small cove on the N.E. side, where the vessel was anchored. At first sight it seemed that there should, surely, be fine shores with ~~the~~ for but for marine collecting. But the one just mentioned proved a pleasant surprise.

Fig. 2.

Fig. 2 represents the general outline of the coast at the anchorage. "1" a small rocky islet some 20 rods long by 3-4 wide, "2" a shallow cove "3" the island itself. The islet is separated from the main island by water only 2-3 fm deep, & a nicely coral sand covered bottom in the cove "2" along the main island, in the direct lee of the islet, & in the quiet waters there produced a fine collection of small marine shells were taken

Nearly all the forms were taken from under the loose low blades. which were ~~quite~~ ~~overlaid~~ smooth firm surface, & the imbedded (loosely) in the loose coral sand

Several new species were taken, among them the pretty Columbella (?) .. which latter species seemed to inhabit the coral sand — the sand always adhering with the low tide level — thus entirely ~~soaked~~ completely saturated with water.

The minute species of Clitia was quite common.

The small Cerithium may be a minature adustum, or another species.

Two large Clitias were taken. The small forms are surely not minature forms of the large ones taken. In the large ones two specimens of young were observed.

James Island

James Bay & the adjacent coastal area offer but little opportunity for marine shell life. The bay itself ~~is a~~ has a loose ~~bot~~ sand bottom composed of the reddish lava sand, filled with little glistening crystals of feldspar & augite. To the N. the bay is bounded by almost perpendicular cliffs of tufa: on the north the recent lava flows make a rough jagged coast. To the west & the S.E. & E. the coast is the same rough, jagged affair produced by the recent flows. A few beach specimens were taken on the S. side, but not over two or three specimens of live shells were observed.

Aug. 8-'06.

Mr. Williams handed me two beach specimens of two species not yet taken - one is the Natica similar & almost identical with the one occurring

as a fossil on Seymour. - The other was a pelecypod with undulated backs - similar to a ~~Panama~~ Panama form.

Chatham

Sappho Cove.

Feb. 10, 1906

This cove is peculiarly favorable to marine life. The ~~shattered~~ structure is that of the terminations of lava flows which have taken the forms indicated (See details of formation from the chart

This side of the island being dwelt in the lee of the usual currents & winds & therefore is without disturbing currents. ~~This nature of this~~ (~~also~~ Show the shallowness of water) as a factor

This nature of things causes the cove to become quite ~~perceptibly~~ warmer than the ~~surface~~ adjacent ocean water. (Temp. this morning was 78° F)

The sand bottom, the loose blocks of lava in the jutting flows, the presence of kelp & sea weed are all factors in assisting marine mollusk life.

absence of heavy surf

This day's collecting was especially good. Secured fine

412

Specimens 8 species 7 2.S. Columbella;
2.S. Purpura; 1.S. Chiton; 4 specimens small
Cypraea.; " basto-dorsal fleshy fossil
4.S; 2.S. Nitre. etc. & small species
& minute shells. among them small
specimens of ~~small~~ minute Cypraea
like shells. & possibly immature
Colleted numerous species of
star fish.

Feb. 13. 1906

Collect on the pen coast just outside
Sappho Cove. The jutting lava streams
& their general flow nature. ~~allows gains~~
form many fine little pools. with
sun worn boulders. Open coast.
Afternoon for marine collecting.
Had excellent success - took several
Cypraea. Two new Columbellas, 4 pen
Veritas, numerous Cricidae etc. &
one or two undetermined forms.
Yesterday collected 12 specimens
a. Trivia, Mexicana Isabella & a
Stimpsons. The latter is important because
this are is evidently one of the fossils
of this region.

Occasional Ideas.

Tryon. Vol. I pps. 166 - ~~169~~ 171
Here reference is made, in speaking of marine provinces & the possibility of proving that West Coast fauna may be identical with or intergrade favorably toward ~~East~~ Coast & or Atlantic species.

Aside from the chronological value. it is important for its geologic significance.

Some possibilities:

1. Cypraea exanthemima (large)
2. " (small)
3. The fossil bivalve of Seymour.
4. Purpura haemastoma.
5. " patula.
6. Tellina peruviana.
7. Mactra alata.

~~P. 171 Tryon~~ Tryon Vol. I. p. 171
Slight reference to Galapagos.

Tryon Vol. I. pps. 96-97.
Good information on the odontophore & directions for viewing the lingual

ribbon for examination:

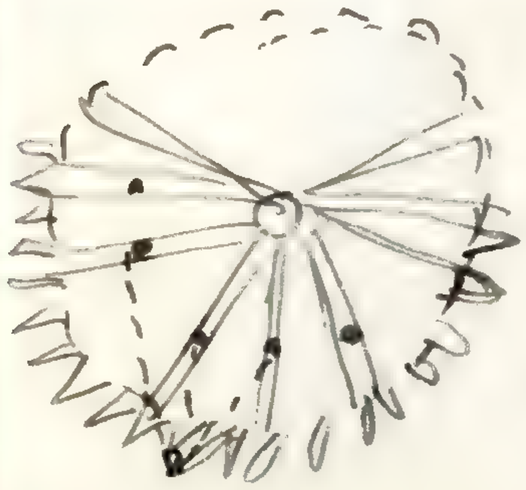
" " Tryon Vol. I pps. 206 & seq.
Same good material on Hypsometrical
~~Dusbru~~ (Altitudinal) Distribution
of Land & Fresh Water Shells.
May be made use of in Environmental
Work on Land Shells.

Feb. 19, 1906

While examining some large many rayed star-fish being prepared as dry specimens my attention was taken by the somewhat glassy lustre appearing from within the openings in the outer borders of the walk system of the animal. Examination showed that that there little glassy areas were small, thin shelled structures.

Several specimens were taken. They were obtained by tearing away a portion of the ~~arms~~ openings, & extracting with slight pliers. The shells were found partly covered with a light membrane like film which covered the aperture of the shell, & extended up into the shell itself. Whether they are harmless & that they are a new species I am unable to tell.

(See Fisher etc.)



The position of the shells was well within the arm channels underneath.

Location of shells. . . (Possibly Stylifer Tryon Vol. 2 p. 135)

March. 17-21, 1906 Albemarle. Iguana Cove etc.

40x

During the past week exploration has been carried on along the S. coast. This part of the coast of this island is especially unfavorable for marine collecting. The whole coastal line is a lava flow so recent that there are no sand beaches or low sloping areas. The lava slope is very gentle (5-7°) and where it reaches the ocean forms perpindicular cliffs so high that only the spray of the high surf may wet the land above. The coastal rocks themselves are so rough that they offer poor facilities for abundant shell life. Where the roughness of the lava blocks has been somewhat eroded away by the action of the surf some few shells were seen - mainly the different common Purpuras & Chitons.

Iguana Cove & its rocks is a much older & firmer formation of a dense basaltic lava which even when specially broken off in the customary large, ~~cubic~~ cubical blocks of this structure, form a good foothold for marine forms. The cove has quite an abundant life (many one characteristic species) and even beach specimens

are fairly numerous.

The absence of beach species along the other part of this S. coast should be cited

This change in the degree of marine life according to locality should be made use of & probably entered into in detail when speaking of the different islands etc

March. 28. 1906 Tagus One.

During the day some collecting was done along the bowlder tide water rocks - the tufa layers of the old craters which form the one & the contiguous territory & the S. the a little depression, well filled with a bright sea moss. & a fine series of a marine shell, not yet taken, has secured. The shell is probably one of the Littorina. The specimens have been placed in alcohol together with a few Patella.

At the same time some specimens

other minute littoral species were taken. These are placed with the others in the vial.

Made a notable discovery of another new species. This one was taken from the stems of leaf coral. Only four specimens were obtained, & are placed in a separate vial, in spirits.

April, 9, 1906.

Collected a few more specimens of the small Cypraea form which lives stated on the stems of leaf coral expread at low tide. Observed that the mantle is prettily colored, a dark brown base with little circular yellow dots with red centres. Placed in vial with others.

Afast Friday: April, 6. I collected a large series of the minute pink Cypraea of the subgenus Trivia. They were exceedingly numerous both the large & small species, & beach specimens. Only some half dozen specimens of this genus have been taken elsewhere & their abundance here suggests something in the particular locality as favorable to this particular variety. Perhaps the cool water, & absence of current, heavy surf & winds.

The beach evidently the sea-bottom is a fine volcanic tufa sand. (Sample taken)

Also a large number of other beach specimens - some merely diagnostic.

Narborough.

Mch. 22, 1906

Visited the mangrove growth on the E. shore of Narborough Island. The mangroves between taken advantage of the little tide water depressions left by the recent lava flow where it reached the ocean & spread out in ramifying streams. The small depressions are well filled with a mud [illegible] detritus. in which the mangroves At the farthest end; ie, the innermost landward end of one of the lagoons I observed a number of Orthima (the small species identical with those taken from the Murex lagoon on N. Duncan Island) they were found attached to the dead mangrove leaves lying on the floor of the lagoon.

(Rather a unique station, and one worth the noting in speaking of the station of this particular species.)

June. 17, 1906.

Caught some fifteen specimens of Plethysoda floating on surface. They are [illegible] of the glass

420

Agalea, Tryon Vol. II p. 89-90-91
with plate reference.

The two wing like organs had a swimming motion much like the flapping of a pair of wings - seeing much like the swimming motion of the "sting-ray".

Preserved in formalin & in alcohol.

July. 1, 1906.

During the last few days I visit this island I spent the collecting period of low water investigating the marine plateau on Gardner's Flood. A notable observation was that hardly any marine shells were to be had. Only in the same plateau which last Sep. afforded such excellent collecting. Only a few plutei, a few ~~fecbis~~ snails Crepidula fornicata, a few large Purpura were obtained. The floating plugs were very numerous.

Very evidently the shells are in deeper & quieter waters breeding.

Tried it [illegible] [illegible]

L 31

Sep. 29, 1906. Temp. Note.

The sudden increase in water temp. with the N. voyage is shown in the tables. No extended collecting was made to obtain any diff. in shells. - but I did observe that the "Purpura planospira" were very abundant - found everywhere on the rocks - while the S. only a few specimens were obtained. - and those larger & perhaps stronger & more adapted to cold the region of the colder waters -

930	10	2402
25	50	150
15	200	10
100	150	25
20	1000	10
10	10	50
25	10	25
100	25	10
500	1455	40
60		40
50		10
150		30
150		2522
200		155
1755		2677

2667 75
1755
3843 0

444

Marine Shell Catalogue.

Pkg. No.		Number of Specimens. ~~No. Species.~~
	Pupura Large smooth spiral. Found at upper limit of tide level. Especially abundant on N.W. cove of Gardner Island.	18
Box No. 4.		
"	Pupura Same type. but smaller - same situs.	45
"	Pupura platulla(?) Sharp spined.	140
"	Pupura planospira Gardner.	25
	"	45
"	Conus North shore of Hood.	20 5
"	Mitre	
	- - - - -	35
"	Chitons	15
	- - - - -	50
Mitre the land shells.	Minute marine forms taken from a little pool in the rocks in tide level on the E coast of Gardner. Probably young Pupuridae. Also some mitre land shells.	208

Box No. 4. 170

Beach specimens.
Various species found on Hood & Gardner

Box No. 5. ----- 3 Cracker Cans {Cocos 1 can. No. 1
Galap. 2 " . No. 2

Can No. 2. Charles Island -- P. O. Bay. ----- 225
Conus, Cerithium, Mitre, & Purpura

Can No. 2
Barrington Island
Purpura etc ---------- 50

Can No. 2
Indefatigable Island
Purpura, Turbo. etc. ---------- 25

Can No. 3.
Cocos, Hood, Gardner, Charles
Chatham
Land Shells. taken out

Bottle No. A
R Indefatigable Island
Species of Gastropod 8

Box No. 5. Can No. 3. Indefatigable Island
Conus (large) 35
" (small) 60
Purpura (pink throat) 30
Murex 5
Cypraea 6

510

Marine Shell Calalogue

Box No. 5		
Can No. 3.	Certhieum	40
"	Bivalves	35
"	Mitre "	30
"	Others	25
"	Murex (small)	180
"	" (spital)	200
"	Others. (Nov. 15-16-'05)	175
Box. No. 9.	Indefatigable	
	Murex	95
" " 10	Indefatigable	
	Murex	60
	Pinna	1
	Oysters, branches.	4
" " 11	Indefatigable	
	Pinna	2
	Bivalves	6
	Turbo	10
	Conus	8
	Cypraea	8
	Ceithium	250
	Melampus	800
13.		
" " ~~12~~	Indefatigable Beach Specimens	20
"	Duncan Island	
"	Bivalves	40

" 434 Pissuella ---------- 50
422
" Conus etc ---------- 50
" Ceritheum ---------- 45

" Columbella etc. ---------- 75
Others ---------- 180
" Clitan. large & small species ---------- 30

" Hood Island
a number of beach specimens with
often of faint pink value. - diff.
species mainly Cypraea etc. ---------- 250
Clitons ---------- 10
~~Cephalopods~~ Gastropods ---------- 20
1 Pkg. - Pisuella. Turbo, Lipilla etc ---------- 30
" " Minute Columbella (?) ---------- 100

Chatham Island.
" Gastropods ---------- 4
2 small red ones
1 gray. speckled
1 red. dorsal. Patella like shell.
" Beach Specimens ---------- 15
" Columbella - minute ---------- 225
Small vial ---------- 25
Glass stoppered bottle Gast. 35. ---------- 10
Small vial. Littorina, etc ---------- 25
Beach Specimens, Strombus etc. ---------- 5
Gastropods ---------- 10
Olividae ---------- 8
Littorina ---------- 350
Cypraea ---------- 16

Marine Shell Catalogue

Chatham Continued

Conus . large & small	60
Bivalves	25
Purpura	35
Olivella	200
" acute apex	15
Mitra	20
Turbo (small)	75
Fissurella	10
Nerita	20
Others	100

Small vial . marked ; taken from star fish 15

(Fittoria) " " " " S. Albemarle 125

" " " Tagus Cove ~~4~~

Specimens taken from the
Rocks of beef portal. 15

" " " Tagus Cove. 120

(Fittoria) Taken from small depression
in rocks within tide limits.
in alcohol.

Beach specimens N. of Tagus Cove. ~~80~~

Olivella . 2 sp. 80

Cypraea 60

140

Conus etc	2
Bulla	20
Bivalves. 9 pair & others	15
Mitrae. etc.	15
Trivia. large	40
" small.	5 50
Cypraea. young. etc.	40
Cypraea. Trivia, in glass vial	50
Bittium. " " " alcohol.	50
Littorina. in glass vial. alcohol.	100
Beach specimens. small bivalves. Strombus. Conus etc.	10
Bank's Bay.	
Columbella etc. plog.	200
Conus, Acithrium etc. plog.	130
Charles. ---- Black Beach Road ----	80
Specimens in alcohol. for anatomical study.	
Glass-stopped bottle	10
Several bright colored Gastropods "sea slugs"	
Test tube	20
	1330
Blacks "sea slugs". gastropods.	
June 5, 06, 9330	
Specimens in alcohol. S. Rudolf.	25
Oysters & Murex. S. Rudolf.	1 75

Marine Shell List.

Indefatigable. - Dove Roads.

Purpura - larger small	100
Cerithium	20
Mitra	5
Fissurella	5
Conus	10
Nerita. Cantharus. etc.	15
Cypraea exanthema	1
Clavus large	12

Indefatigable - Murex Lagoon.

Cerithium.	50
Large rock bivalves	25
Melampus - in formalin & in alcohol.	1500

James. N. of Sulivan Bay.

Conus. Cerithium. Mitra etc. 1 Bivalve.	60
Columbella - tan spotted	50
" - small dark	150
Other - small	50
Chromodoris - in bottle with formol.	50
Sea slugs etc. large & Slugs were of a light brick-red before being placed in alcohol. The color is lost shown in formalin hardened specimens of The Challenger collecting.	20
One live Cypraea & one Pecten also Conus were preserved in alcohol in a screw-topped jar	2

438
Bottle.
4-6

Sea slugs in alcohol - old "gunpowder bottle" - taken from upper limit of high tide on the rocks at Dove Rocks, Quelpart. 80

Miscellaneous forms - from N. of Sulivan Bay. James. 40

~~Rufa~~ Purpura planospira from Tower 75

Ocean Temperatures and Air.

Date	Water	Place	Air
Feb. 1. '06	77.° F.	Hood	78.° F.
" 2. "	76.5	"	76.
" 3. "	78.	"	78.
" 4. "	78.	"	78.
" 5. "	78.	"	76.
" 6. "	77.	"	78.
" 7. "	"	Sapphire Cove "	77.
" 8. "	78.	"	".
" 9. "	76.	"	".
" 10. "	78.	"	".
" 11. "	"	"	78.
" 12. "	"	"	77.
" 13. "	"	Bassa Pt. "	74.
" 14. "	"	"	76.
" 15. "	"	North C. Ch. "	".
" 16. "	80.	"	78.
" 17. "	"	"	"
" 18. "	"	"	"
" 19. "	79	"	"
" 20. "	80	Wreck B. "	"
" 21. "	79	"	77
" 22. "	79	"	78
" 23. "	"	"	79
" 24. "	"	"	77
" 25. "	78	Charles. C. B. "	76

Date	Water	Place	Air
Feb. 26.	79.	Cor. B. C. I.	77.
" 27.	78.	B. B. Rd.	78.
" 28	"	"	77.
Mch. 1.	77.	"	78.
" 2.	78.	"	77.
" 3.	"	S. Albemarle "	76.
" 4.	77.	"	".
" 5.	79.	"	72.
" 6.	78	"	76.
" 7.	"	"	"
" 8.	79.	"	77.
" 9.	78	"	".
" 10.	"	"	"
" 11.	"	"	76.
" 12.	76.	"	".
" 13.	78.	"	77.
" 14.	"	"	76.
" 15.	76.	"	75
" 16	73.	"	74.
" 17.	74	Iguana Cove	73.
" 18.	"	"	74.
" 19.	"	"	".
" 20.	80	"	76.
" 21.	"		".
" 22.	79	"	77.

Ocean & Air Temperatures

Date →	Water	Place	Air
		Tagus Cove	
Mch. 23	80	"	76
" 24	79.	"	75.
" 25	74.	"	73.
" 26	70	"	72.
" 27	72	"	74.
" 28	75	"	76.
" 29	74.	"	"
" 30	73.	"	75.
" 31	74.	"	75.
April. 1	72.	"	73.
" 2	" .	"	74.
3	74.	"	74.
4	73.	"	".
5	74.	"	76.
6	72	"	73
7	70	"	74
8	69	"	72
	70	a. m.	73
9	64	P. m.	74
10	63	"	71
11	66	"	70
12	"	"	"
13	"	"	"
14	"	"	71
15	"	"	70
16	65	"	71

Date →	Water	Place	Air
April. 17	69	Tagus Cove	71
18	68	"	72
19	69	Ocean off S. Albemarle	73
20	72	"	72
21	"	"	73
22	"	"	"
23	71	"	"
24	72	"	74
25	71	"	"
26	73	"	"
27	72	"	"
28	74	"	"
29	73	"	72
30	74	Villa Mil.	73
May. 1.	70	"	72
2	71	"	73
3	71	"	"
		Ocean W. & S. of Charles	
4	72	"	72
5	70	"	72
6	73	"	73
7	72	"	74
8	76	"	75
9	72	"	74
10	74	"	"
11	73	"	"

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Ocean and Air Temperatures

Date	Water	Place	Air
Sep. 25	22°C.	Hood	22°C.
26	"	"	22.5
27	22.5	"	23.
28	22.	"	22.5
30	"	"	"
Oct. 6	69°F.	Charles	69°F.
7	68	"	67
8	67	"	70
10	70	"	70
11	"	"	"
13	69.5	"	71
16	67.5	Chatham	70
17	66	"	71
18	66.5	"	70
21	70	Barrington	70
23	"	"	"
24	"	"	"
Nov. 10	73.5	"	67
11	73	"	68
13	71.5	"	72
14	72	"	71
16	72	"	"
17	"	"	72
22	72.	Seymore	74
23	73	"	74
25	73.5	"	71.5
Nov. 27	75.5	"	74
28	75	"	74.5
29	74	"	71
Dec. 3	69.	Duncan	73
4	70	"	70
5	"	"	"
6	71.5	"	71
13	72.5	"	73
14	72	"	72
15	"	"	"
22	73.	James Bay.	71
23	72.5	"	72
28	70	"	71
Jan 15	76	Academy B.	75

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Ocean & Air Temperatures

Date	Water	Place	Air
May 12	72	Ocean S. & W. of Charles	73
13	"	"	72
14	71	"	"
15	68	(Near Hood) "	71
16	"	"	73
17	"	"	"
18	70	S. of Indefat. "	71
19	71	"	72
20	70	"	72
21	71	"	71
22	70	"	71
23	71	Black Beach "	71
24	72	"	72
25	70	"	71
26	69	"	71
27	70	"	71
28	71	"	72
29	71	"	72
30	70	"	71
31	71	"	72
June 1	70	"	71
2	70	"	71
3	69	"	70
4	69	"	70
5	70	"	71
June 6	70	"	70
7	"	"	"
8	72	S.W. Charles "	72
9	"	"	"
10	72	"	72
11	70	"	70
12	72	"	72
13	71	"	"
14	"	"	"
15	72	"	72
16	"	"	"
16	70	"	71
17	"	"	"
18	"	"	"
19	71	"	72
20	72	"	72
21	"	"	"
22	"	"	73
23	71	"	72
24	70	"	71
25	"	"	"
26		Hood.	"
27	"	"	"
28	71	"	"
29	"	"	"

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Ocean + Air Temperatures.

Date	Water.	Place.	Air.
June 30	70	Hood	71
July. 1	69	"	69
2	70	"	70
3	70	"	69
4	68	Chatham	66
5	67	"	"
6	66	"	67
7	"	"	"
8	64	"	66
9	65	Barrington	"
10	67	"	67
11	66	Academy Bay	66
12	69	"	67
13	67	"	66
14	"	"	"
15	68	"	67
16	67	"	66
17	"	"	65
18	68	"	66
19	"	"	67
20	69	"	"
21	67	"	65
22	68	"	"
23	67	W. Indefat. "	66
24	"	"	66

Date.	Water.	Place.	Air.
July. 25	68	W. Indefat.	66
26	69	"	"
27	"	Seymour	68
28	68	James	67
29	"	"	66
30	"	"	67
31	"	"	67
Aug. 1	67	"	67
2	"	"	"
3	"	"	"
4	66	"	65
5	"	"	"
6	"	"	"
7	67	"	66
8	68	"	68
9	"	Conlez Mt.	"
10	"	"	"
11	67	"	67
12	"	Duncan	66
13	"	"	"
14	"	"	"
15	68	"	67
16	"	"	"
17	67	"	66
18	"	"	"

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4.

Ocean & Air Temperatures

Date	Water	Place	Air
Aug. 19	67	S. Albemarle	67
20	"	"	"
21	68	"	67
22	"	"	"
23	67	"	66
24	"	"	67
25	66	"	66
26	68	"	67
27	"	"	"
28	"	"	"
29	"	"	"
30	"	"	"
Sep. 1	67	"	66
2	"	"	"
3	"	"	"
4	68	"	68
5	"	"	"
		Chatham	
6	63	"	62
7	63	"	62
8	63	"	63
9	63	"	64
		Barrington	
10	65		66
11	"	"	"
		E. of Indef	
12	68	"	68
13	69	"	68
		Torver	
14	73	"	72
15	73	"	72
		Torver	
16	73		74
		Bindloe	
17	"	"	72
18	"	"	"
		Abingdon	
19	73	"	72
20	"	"	"
21	74	"	73
22	"	"	"
23	"	"	"
		Wenman	
24	76	"	77
25	78	"	"
		Culpepper	
26	"	"	78
27	"	"	"
		N.W. of Calap.	
28	80	"	81
29	"	"	"
30	"	"	"

Water Temp. at Chatham & Vicinity 10° warmer than that at Torver, Soame Isl. Coms. N. Currents - probably the Panama.

	Water	Place N.W. of G.	Air
Oct 1	80	"	81
" 2	82	"	83
3	"	"	"
4	"	"	"
5	"	"	"

theastern islands. Prudence strongly urges that we know too little of the mollusk fauna yet to intelligently its inter island distribution. !!!

Taking the forms enumerated ~~above~~ in the table showing the distribution of the species and omitting the Onchidiidae and species of Auriculidae and Siphonariidae all of which are denizens of the salt marshes or beaches, we have 76, of which 15 are found on more than one island, 15 on more than two islands and 13 are found without material change on four islands; all of the latter are found in both the central and southeastern groups. One of the species, or perhaps two, are probably common to the mainland of South. Am. as well as the Is., & all of them doubtless have been derived from the fauna of the Panamic & Southern Am. regions.

A. Albatross; B. Baur; C. Cuming; D. Darwin; H. Habel; K. Kellett; P. Peterel; W. Wolf

	Groups of the Galapagos Islands									No. of Specimens Sect.
	Chatham	Charles	Hood	Barrington	Indf.	Duncan	Albemarle	James	Bindl	
	Southeastern					Central			N.E.	
Bulimulus nux	K.A.B.W.	C.P.W.A.								374
B achatellinus	K W B		H							2
B. Darwini									H	
B. Wolfi					W					1
B. duncanus						B				6
B. rugulosus	D K C	P A W B								64
B. var nudus		W								
B. planospira		B								71
B. ustulatus		C						C		14
B. calvus	K	C W A								2
B. nucula	B									6
										66
B. eschariferus	D K W A B	P		Sa H.						4
B. var ventrosus	A			W. B						6
B. var pileatus	A									5
B galapaganus		B								2
B. perspectivus	W									12
B. jacobi.	B W	C					B W	C		4
B. var. cinereus								WAB		1
B. var acutus	W			B	B	B A		C		16
B. olla				B	B	B A				4
B Tanneri					A					
B. amastroides	A									25
B. var. curtus	W A B									34
B. unifasciatus	K B	C P						C		22
B. Simrothi							W B			85
B. Bauri	B									16
B. Canaliferus	W									1
B. Sculpturatus								A		
B. Nesioticus										
B. frugiferus					A			C		
B. Reibischi										
B chemnitzioides	K H W A B									
B. Habeli	H W A B									
B. n. sp INDEFAT.					W			W		
Trochomorpha(?) Bauri	D (?)						B			1
Vitrea chathamensis	B									1
Conulus galapaganus	B						W B			3
Pupa Wolfii										4
(Bettii) Pupa clausa Bettii					W					
Succinea brevior	W	P A				A	B	B		
Succinea brevior										
S. producta	W B						B			86
S. corbis							B			21
Leptinaria chathamensis	W B						W			15
L. sp							W			15
Helicina nesiotica	W B								H	19
Auricula stagnalis										55
Melampus trilineatus			H							
Tralia panamensis			H							12
Pedipes angulatus									H	
Siphonria gigas		A								6
Williamia peltoides	H	H	H							3
Onchidium Lesliei		A					A A			3
Onchidella Steindachneri		A H					A			7
Number of Forms 54	25	17	4	2	6	3	11	9	3	1188

I. Table of known distribution of the Galapagos landshells.

Name of species.	Chatham	Hood	Gardner	Charles	Champion	Barrington	Indefatigable	Duncan	Tortuga	Albemarle	Narborough	Jervis	James	Tower	Bindloe	Abingdon	Daphne
B. achatellinus	o	o															
B. nux ×××	o		o	o	o												
B. asperatus				o													
B. bauri	o																
B. planospira ×××			o	o	o												
B. rugulosus	?			o													
B. invalidus				o													
B. approximatus		o															
B. vstulatus ×××				o													
B. calvus	o			o									o				
B. elaeodes									o								
B. hemaerodes									o	o							
B. pallidus									o						o		
B. rugatinus	o								o								
B. cinerarius									o				o				
B. jacobi									o	o		o			o		
B. tanneri							o		o								o
B. perrus										o							
B. hoodensis ×××		o															
B. unifasciatus ×××	o			o									o				

(18.)

II.

Table continued.

B. olla						o	o	o				o		
B. ×××eschariferus	o			o		o								
B. perspectivus	o			o										
B. ×××snodgrassi		o	o	o										
B. cucullinus		o		o		o								
B. galapaganus				o										
B. ×××amastroides	o													
B. nucula	o			o										
B. trogonius									o					
B. ×××simrothi									o					
B. tortuganus								o	o					
B. albemarlensis									o					
B. ×××akamatus					o									
B. adelphus					o									
B. wolfi					o									
B. lycodus					o									
B. alethorhytidus					o									
B. cymatias					o									
B. ochsneri					o									
B. saeronius					o									
B. ×××duncanus						o								
B. jervisensis										o				

III. Table cont'd.

Name of species.	Chatham	Hood	Gardner	Charles	Champion	Barrington	Indefatigable	Duncan	Tortuga	Albemarle	Narborough	Jervis	James	Tower	Bindloe	Abingdon	Daphne
B. darwini												o			?		
B. sculpturatus ×××													o				
B. rabidensis												o					
B. rugiferus													o				
B. nesioticus							o						o				
B. reibischi							o										
B. nudus				o													
B. chemnitzioides ×××	o																
B. habeli	o																
? B. terebra	o																
B. indefatigabilis							o						o				
B. canaliferus ×××	o																
Pupilla munita ×××				o				o		o				o			
Pupilla reibischi									o								
Pupilla clausa									o								
Guppya bauri		o						o		o						o	
Evconulus galapaganus	o												o			o	
Vitrea actinophora	o												o				
Vitrea chathamensis	o								o				o			o	
Endodonta helleri									o	o			o				
Succinea bettii	o			o			o	o		o			o			o	

(20)

Table continued.

? Succinea wolfi			o				o						
Succinea brevior	o		o										
Succinea producta	o		o			o	o	o		o			
Succinea corbis			o				o	o					
Tornatellina chathamensis	o		o				o						
Helicina nesiotica	o		o				o						
Helicina ochsneri	o						o						
Auricula stagnalis						o	o					o	
Melampus trilineatus		o											
Tralia panamensis		o											
Pedipes angulatus												o	
Siphonaria gigas			o										
Williamia galapagana	o	o	o										
Onchidium lesliei			o				o						
Onchidella steindachneri			o				o						

Bm
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